THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. DECEMBER 27, 1894. CHICAGO, ILL. NUMBER 52

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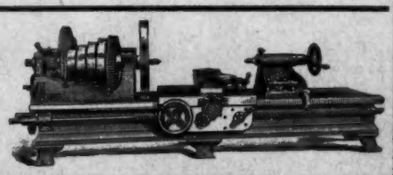

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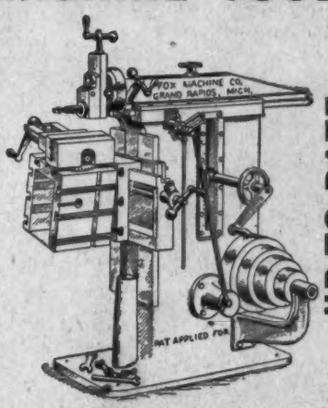

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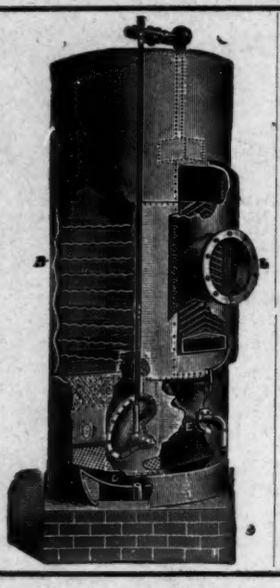

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75	"	40	"	"	"	"	"
180	"	52	"	"	"	"	"
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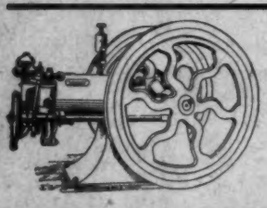

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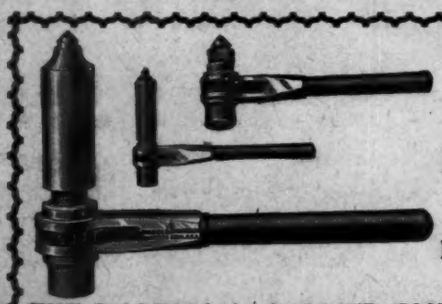

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THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. DECEMBER 27, 1894. CHICAGO, ILL. NUMBER 52.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The last week of 1894 is probably the least eventful in the year, in iron and steel. It ends a year of which no high expectations were indulged at the opening; and while the volume of business has been larger in the latter half than was looked for, the last month has brought the lowest prices of the year and the lowest ever known. Some of the transactions reported in the past fortnight are scarcely to be taken as fixing the market but rather as determining the absence of market. The effort everywhere to have little stock to take account of on Jan. 1 explains the lull in large part. With pig iron selling at cost and the buyer understanding the fact as well as the seller, it is not to be presumed that the wait is due to any expectation of lower prices. When a sale of Southern iron is reported at a price equivalent to $5.90 at the furnace for gray forge, it is very evident that other considerations are ruling than those ordinarily governing business transactions and that the desire to realize is uppermost rather than any fear that the market will go lower. But in the main the attitude of the larger Southern producers is still that of refusing to accept long engagements on the basis of the past month. There has scarcely been a market for Bessemer pig and steel billets the past week, but Pittsburg prices may still be quoted at $10.15@$10.25 for the former and $15@$15.25 on the latter. In the Chicago market there has been some business in rails in advance of the large buying, and several of the leading lines are expected to contract after the middle of January. Two or three Eastern trunk lines are gathering up their estimates of needs, from division heads, and may be looked for in the market in the next three weeks. There is a feeling that the requisitions will be considerably larger than last year's. The general acquiescence in the pooling bill in the House indicates a recognition of the fact that fair freight railroad charges are the only guaranty of larger railroad buying capacity. If the amendments proposed by a leading line do not result in defeating the bill in the Senate, there will come an end of the secret rates that have permitted the iron and steel works of one district to take the trade naturally tributary to another. Only in the past week there has been further complaint from the Eastern mills of the low prices quoted from the Central West, that captured some business the East had counted on. But in the main, prices of mill products have not bent under the holiday depression as pig iron has. The reductions in wages announced at Pittsburg the past week apply to both blast furnace and steel works labor and are calculated to put the steel-maker's labor cost more nearly on the market basis of today. Fresh rumors that property on Lake Erie has been acquired by Pittsburg interests have been started, but are authoritatively denied. The tin plate situation presents no new developments, except that the plants that started non-union are making good progress. It is becoming plainer that the capacity to produce tin plate in the United States from home rolled black plate is nearly equal to the home demand and that home competition, independent of that from Wales, will insure a low level of prices.

THE CLEVELAND OUTLOOK.

There has been no disposition as yet to test the ore market on contracts for 1895; furnacemen seem rather inclined to hear first from the iron mining interest. There are ore buyers who are not in position to appreciate all the features of the situation that concur in suggesting a higher level of prices for standard Bessemers; but there are others who concede that if the leading companies are to take a stand for a better figure and will announce their position early an influence for the better might be exerted on the Bessemer pig market, that for the time being is weak beyond precedent. Pittsburg reports tell of sales at $10 by local furnaces, and while $9.40 and $9.50 valley furnace iron is talked of, it is difficult to locate transactions on that basis. Nearly all valley makers seem to have decided to await a turn in the market, which all look for after the first of the year. The Ohio Steel Co.'s plant will start Jan. 15, and furnaces nearest it appear to be accumulating iron in anticipation of the demand that will mature at that time. Foundry iron has continued weak, with very few transactions. In finished material there has been a fair amount of contracting on bridge account and sellers of mill products are watching one or two marine contracts that are likely to be placed soon. Prices continue on the basis quoted last week. Inquiry for January delivery is fair, but quietness is the rule. Structural work gives promise of a fair tonnage early in the year. Plates have shown sharp competition between Eastern and Central Western mills.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The last week has been a quiet one in almost every branch of the iron business in Chicago, as was only to be expected so close to the holidays. The tone of confidence noted in our recent reports, is still perceptible, however, and in some cases has even increased. Pig iron sellers report a rather small week's business, but as well a good demand for delivery after the first of the year, and it is probable that January will show a large volume of sales. Business for next year has opened up in rails, several fairly good sized lots having been disposed of. Some of the larger roads have signified their intention of coming into the market shortly after the first of the year, and it is probable that considerable business will be closed in January. Other branches of the market are about as last reported, and it is likely that business generally will be very large in the first two or three weeks of 1895.

PIG IRON.—Last week was about as good as the week before in point of sales. For local iron one order was taken of 750 tons, one of 600 and several of 500 and less, with quite a number of car-load lots. A very large tonnage is in prospect for the first of the year, and it is probable that the volume of business in January will be fully as large as the most sanguine dealers expect. Prices are being very well maintained, and in fact in a number of instances sales have been made at rather higher prices than we quote. Buyers appear to be realizing that the extremely low range of prices that have been maintained in the past is to be considerably increased after the first of the year, and consequently has been buying in the past month rather more heavily than was expected. Southern iron is quiet, with sales ranging from 300 tons down. Prices are being lived up to rather better than they were last week, and some of the furnaces claim that quotations will be advanced shortly after the first of the year. Lake Superior charcoal is quiet with only a small trade in carload lots. Quotations are made as follows:

Lake Sup Charcoal.....	$13 00@14 50	Southern No. 2 Soft.....	10 00@10 25
Local Coke Fdy. No. 1...	10 25@10 50	South'n Silveries No. 1.	$11 50@11 75
Local Coke Fdy. No. 2...	9 75@10 00	South'n Silveries No. 2.	11 25@11 50
Local Coke Fdy. No. 3...	9 40@ 9 65	Jackson Co. Silveries...	15 00@16 00
Local Scotch Fdy. No. 1.	10 25@10 50	Ohio Silveries No. 1.....	14 00@14 50
Local Scotch Fdy. No. 2.	9 75@10 00	Ohio Silveries No. 2.....	13 00@13 50
Local Scotch Fdy. No. 3.	9 50@ 9 75	Ohio Strong Softeners...	13 00@13 50
South'n Coke No. 1.....	11 00@11 25	Alabama Car Wheel.....	17 50@18 00
South'n Coke No. 2.....	10 25@10 50	Malleable Bessemer.....	10 50@11 25
South'n Coke No. 3.....	9 75@10 25	Coke Bessemer	11 25@11 50
Southern No. 1 Soft.....	10 25@10 50		

BARS.—There is an excellent demand for bar iron and steel for delivery during the first six months of next year, but so far very few orders have been received. In the past week almost no business has been done except in carload lots. Prices are well maintained, and are now made at 1.05c. to 1.07½c, for common iron; guaranteed, 1.15c. to 1.20c.; steel bars from strictly billet stock, 1.25c.

RAILS AND TRACK SUPPLIES.—No orders have been taken for delivery this year, but several, ranging in size from 2,000 to 3,000 tons, have been booked for delivery in the first three months of next year. It is expected that the larger roads will commence buying shortly after January 1st, and that orders will be given for large amounts. One of the local mills, either the South Works or the Joliet mill, will shut down Jan. 1 for two weeks. Prices are made at $25 for rails for delivery next year. Track supplies are quoted as follows: Splice bars, 1.30c to 1.35c; track bolts, 2c. to 2.10c; spikes, 1.65c. to 1.75c.

STRUCTURAL MATERIAL.—Very little business was done in the past week; only a few orders of limited amounts being taken for building shapes, while bridge material was in light demand. Quotations are as our last report: Beams and channels, 1.45c to 1.50c; angles, 1.40c to 1.45c; plates, 1.40c to 1.45c; tees, 1.65c. Small lots from stock are quoted at from ¼c to ½c higher.

BILLETS AND RODS.—The market has been quiet with only a few small sales made, but the inquiry for delivery the first part of next year continues to be very large. Quotations are unchanged at $17 for billets, and $23.50 for rods.

PLATES.—Little was done last week, although the sales were quite a little larger than had been expected by the local dealers. The demand for delivery next year is excellent and prices are very firm. Quotations are made: Tank steel, 1.35c to 1.40c; flange steel, 1.50c to 1.75c; firebox steel, 1.75c to 5c; boiler tubes, 75 per cent. discount.

MERCHANT STEEL.—The local dealers report a fairly good business the past week with an increasing demand for delivery next year. Prices are unchanged and are quoted as follows: Open-hearth spring, tire and machinery steel 1.75c to 1.80c; smooth finished tire and machinery 1.50c. to 1.60c.; Bessemer bars 1.35c. to 1.45c.; tool steel, 5.50c to 7.50c.; specials, 11c. and upwards.

SHEETS.—Both black sheets and galvanized have been quiet with only small orders taken. It is not probable that any large business will be done until the second or third week of the new year. Prices are made at 2.35c to 2.40c for No. 27 common; 2.40c to 2.45c. for steel sheets, and 80 per cent. discount for galvanized sheets.

OLD RAILS AND WHEELS.—No business of any consequence came up last week, and prices are only nominal. Old iron rails, $10.50 to $11; old steel rails, $6.50 to $7 for short, and $8.75 to $9 for long lengths; old car wheels, $8.50 to $9.

SCRAP.—The demand for scrap has fallen off considerably and sales were small. It is probable that a better business will be done after the first of the year. Prices are made as follows: No. 1 forge, $8.50 to $9; No. 1 mill, $7; No. 1 machinery, $7.25; axles, $12.50 to $13; cast borings, $3.50; wrought turnings, $5.25; axle turnings, $6.25; mixed steel, $6; heavy cast, $7.50 to $8; stove plates, $5.75 to $6; heavy melting steel, $6.75 to $7.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. Wage adjustments at the works of the principal producer in the Pittsburg district have attracted considerable attention the past week, both on account of the lower tonnage rates that have been put into effect on the higher-priced work and of the dropping of men in some departments owing to the introduction of machinery and the lengthening of hours for some of the workers. When all is averaged up and consideration is given to the large sums spent in costly equipment the past two years and the notable reductions in prices of all mill products in the twelve months just ending it would appear that the latest adjustment is only such as the producer must have. In the market week just ending the conditions of the previous week have continued unchanged. The transactions in Bessemer pig have been lots of 1,000 tons to 5,000 tons—not a large total—at $10.25 Pittsburg and two or three valley furnaces have made sales at $9.50@$9.60 at furnace, deliveries to April 1. The coke question seems to have practically settled itself on a $1 basis, since contracts enough have been made for three and four months at that figure to establish the market, and it is intimated that some 90c.

coke has been sold. In foundry and forge iron a very light business has been done at $10.25 for No. 2 foundry and $9.50 for gray forge. Billets have continued weak with little trading, prices ranging from $15 to $15.25. Some rail orders are looked for by the middle of January, and several roads are known to be making up their specifications. In general, mill products have been in very light demand and negotiations on transactions of any size are not likely to be taken up until after the new year comes in. Some sales of wire rods are pending; on recent buying $22 has been shaded.

Buffalo. There is quite as much business doing as could be expected at this period of the year, and consumers are, as a rule, endeavoring to run their stocks low for the annual inventory. New business is therefore light, but deliveries on contracts and recent orders are going rather more freely than customary. There has been some pressure to sell from two or three Northern furnaces whose product was not going off fast as made, which has resulted in making what have been minimum quotations, the general market.

St. Louis. A little business continues to go on, but it is mostly of the sorting up kind that is expected just before the annual inventory date. Our foundrymen are not getting as much encouragement as they had looked for, but at the same time they are doing a great deal more than a year ago, and taking all things together, perhaps have not much reason to complain. It is believed that the consumption of iron in the West will be increased next year.

Cincinnati. Those who expected a dull season immediately preceding the holidays have not been disappointed. A good many inquiries are floating about but very little buying is done. There is no reason to expect any change in this general situation until perhaps the middle of January, when it is believed that a good many contracts for pig iron will be made. It is a well-known fact that every contract for iron that has been placed during the past four years, if the deliveries ran a few months ahead, proved to be a losing one to the buyer before it ended. It is not surprising, therefore, that consumers are very chary about taking hold freely for the future, as it is not easy to be convinced that the uniform experience of four years is now to be reversed. Intelligent buyers, however, who study the situation, believe that an end must come some time to this long and monotonous decline, and that it is now very near at hand. It seems reasonable, therefore, to look for quite liberal buying after the turn of the year. The most noteworthy features of the market today are firmness of the largest sellers both of Southern and Northern iron and weakness of the smaller producers who must have their daily orders or suffer. The largest producer of Southern iron holds rigidly to its schedule of prices and in spite of the talk of lower figures prevailing, has booked an average of about 1,000 tons per day during the current month. Reports from the foundry trade generally are not discouraging. While some complain of extreme dullness, others again are very busy. The general tendency is towards larger heats.

THE Columbus, Hocking Valley & Toledo is the latest company to have 60-ft. rails rolled for experimental use. About one mile of track has been laid recently on this road with rails of that length. The Pennsylvania has laid a few miles of track with 60-ft. rails and the Lehigh Valley has put in some 45 ft. rails.

A SAMPLE has been received at this office of the asbestos fibre put on the market by Ed. Wertheim. It is in increasing demand for piston packing.

PERSONAL.

Mr. G. L. Luetscher has resigned his position as superintendent of the open-hearth department of the Otis Steel Co., Limited, of Cleveland, to take the management of the Granite City Steel Co., of Granite City, Ill., which will have its works in operation by June 1, 1895. This company is controlled by the Niedringhaus interest of the St. Louis Stamping Co.

Frank Wick has resigned his position as manager of the mills of the Mahoning Valley Iron Company, Youngstown, O., and has been succeeded by William F. Bonnell.

Mr. H. L. Hollis, of Chicago, will leave Jan. 5th for a trip abroad, combining business with pleasure. On his return he will devote his time to the business of mining and metallurgical engineering, having sold out his interest in the firm of Hollis & Emmerton, chemists.

Mr. F. A. Emmerton, who for the last year has had charge of the Cleveland business of the firm of Hollis & Emmerton, analytical chemists and mining and metallurgical engineers, on the dissolution of the firm on Jan. 1, 1895, will continue in the same business at No. 9 Bratenahl Bldg., Cleveland. Mr. Emmerton was chemist at the Joliet Steel Works for 13 years, and later was for eight years blast furnace superintendent at the same works.

Major John Linton, who died December 5, at his home in Rochester, Beaver Co., Pa., was the father-in-law of General Manager James M. Swank, of the American Iron and Steel Association. Major Linton was in his 86th year and was probably the oldest iron master in Pennsylvania. Nearly half a century ago he was engaged in the manufacture of charcoal iron. In 1846 the firm of Huber, Linton & Myers built Somerset Furnace, in Somerset county, and in 1847 Major Linton purchased an interest in Mount Vernon Furnace, at Johnstown, which had been built also in 1846 by Peter Levergood & Co. and was the first furnace at that place.

The Steam Shovel as a Labor Saver.

The primary object of the steam shovel is to supersede hand labor in shoveling; but with the advent of the steam shovel came increased and multiplied opportunities for its use, and it is now doing work which by hand labor would have been impossible. Inasmuch as in nearly all cases the material to be shoveled or excavated has to be hauled away, the chief function of the steam shovel is to dig the material and load it on cars. At first wagons drawn by horses were used, and are still used in certain cases, but the wholesale manner in which the shovel digs makes it necessary to take away its product by train loads in rapid succession rather than by wagon loads. It is in this capacity and in its tirelessness in maintaining it that the economy of the machine over manual labor is manifest. The average laborer can shovel from a bank of fairly loose earth into a car or wagon five feet high not over four cubic yards or six tons per ten hours, and where the material is at all hard or compact much less than this is accomplished. Assuming a laborer's wages to be $1.50 per day, the cost of loading the cars will be 37½ cents per cubic yard, or 25 cents per ton. If plowing, picking or blasting is necessary, the cost of placing the material on the cars may be $1 per cubic yard or over. The steam shovel, on the other hand, will dig and load as much as 1,500 or 2,000 cubic yards, equal to from 2,250 to 3,000 tons, in the same time, and this with the labor of six men, three on the machine and three to lay its track as it progresses. To do 2,000 cubic yards in the same time, at four yards per day per man, would require 500 men, so that with a single powerful steam shovel six men can do the work of 500.

These figures are startling facts, and although they will necessarily vary greatly with different conditions and in material of different degrees of hardness, they exhibit strikingly the marvelous superiority of this form of steam labor over hand labor.—[A. W. Robinson in Cassier's Magazine for January.

THE puddle mill of the Alabama Rolling Mill Co., Birmingham, Ala., will resume operations in full Jan. 7, and the finishing mill will go on double turn in all departments one week later. Improvements recently added at these works will increase their production to 2,400 tons per month.

THE IRON TRADE REVIEW

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DECEMBER 27, 1894.

NEXT WEEK'S ISSUE.

The Iron Trade Review of Jan. 3 will be several times the size of the regular edition and will contain a number of features that it is believed will commend themselves to the favor of subscribers. Special contributors furnish articles on topics of moment to iron ore, blast furnace, iron and steel works, foundry and machine shop interests, and many of the articles are illustrated liberally with half-tone and line engravings. The issue will reach practically every firm in the country interested in the production of iron and steel in any of their forms, and it has been the aim to distribute the features evenly over the five-fold field included in mines, furnaces, mills, foundries and machine shops.

The thought has been, in preparing such an issue for the initial number of the new year, to give expression in this way to the confidence that 1895 is to bring better things for all the interests above enumerated than either of its predecessors. There will be some tangible evidences in the pages of our next issue, moreover, that this faith is shared by a goodly number of representative concerns in all parts of the country.

RAILWAY CONSTRUCTION IN 1894.

The returns of the *Railway Age*, of which a summary is published in advance of the detailed statement, show that in 1894 there have been laid in the United States 1,919 miles of new railroad track and this is less than in any one of the last twenty years and the least in 30 years, with the exception of 1875, 1866 and 1865. For the last five years the decline has been steady—from 5,670 miles in 1890 to 4,282 miles in 1891, 4,178 miles in 1892, 2,635 miles in 1893, and 1,919 in the year just ending. Our contemporary notes that the period of decline which followed the culmination of 1887, when nearly 13,000 miles were built, has been longer than the other periods of reaction in the history of the country, but that "all signs indicate that the bottom has been reached and that a revival of railway building has commenced." With only 525 miles of track laid to July 1, it is indeed surprising that the total for the second half of the year should turn out to be nearly three times as much.

Arizona leads in the record for the year, having added 193 miles on four lines. Illinois is second with 148 miles on eight lines. Other States adding more than 100 miles are, in order, Pennsylvania, Michigan, Maine and New Mexico. These six States furnish nearly 40 per cent. of the total of new mileage. The *Railway Age* makes this interesting statement as to existing mileage and the possibilities of the immediate future:

The populous heart of the country, composed of the five Central Northern States, already having a greater mileage than any other group, leads by the addition of nearly 450 miles, thus illustrating the fact, of which Illinois, Ohio, Pennsylvania, New York and other great railway states are also evidence, that there is still room for more railways even in the regions that seemed to be best supplied.

The steam railways of the United States now aggregate in length no less than 179,672 miles. Of this mileage 54,300 miles were added in the last ten years, an average of 5,430 miles each year. If the next five years show an average of a little over 4,000 miles of new road per year—and the promising enterprises already on foot aggregate far more than 20,000 miles—the opening of the year of our Lord 1900 will see in this still undeveloped country of magnificent proportions 200,000 miles of railway in operation for the transportation of passengers and freight, not counting the vast and rapidly increasing mileage of light roads, electrical and others, which will share with the steam railways in short distance passenger travel.

Illinois still holds her position as the State of greatest railway mileage, the additions of the past year bringing her present total to 10,576 miles, which is over 1,000 miles more than that of the next highest. The other States having above 8,000 miles are now as follows: (2) Pennsylvania, 9,564; (3) Texas, 9,272; (4) Kansas, 8,931; (5) Ohio, 8,652; (6) Iowa, 8,513; (7) New York, 7,150. These seven great States now have 63,658 miles of railway, or over 35 per cent of the entire mileage of the country, while they contain less than 20 per cent of the total area (not including Alaska) and nearly 40 per cent of the population. But these ratios must greatly change as unpeopled country is settled. Thus, when Texas, if it ever does, averages as many miles of railway in proportion to area as Illinois today, that great southwestern empire will have nearly 50,000 miles of road. That, however, will be sometime after the present race of state politicians has ceased to fight the railways which have made Texas what she is. But meantime Illinois is continuing to increase its own standard of comparison, and when this fertile prairie State equals hilly Massachusetts in respect to the latter's present ratio of railway to area it will have 14,400 miles of road, and even then will not be satisfied. And so the work goes on.

LAKE SHORE SITES FOR STEEL-MAKING.

Attention has been directed in various ways in the past few weeks to the southern shore of Lake Erie as a steel-making situs. The reports from Huron and Lorain of purchases of land by Pittsburg steel companies have been frequent and circumstantial; and the last two days has brought one, somewhat more positive than the rest. It may be said on authority that no deal has been closed by which the Johnson Co. divides the advantages of its location with any other steel company; and the important steel plant extensions now under way in the Pittsburg district are themselves an answer to all reports that the chief producing company is looking elsewhere for blast furnace and steel works sites.

But Pittsburg is by no means unmindful of the developments on the south shore of Lake Erie. A Pittsburg manufacturer, who recently visited Lorain, has written the Pittsburg *Dispatch* expressing the opinion that other great steel plants will eventually be located on the lake shore. And the *Dispatch*, which has been the most enthusiastic newspaper advocate of the project for a canal from Lake Erie to Pittsburg, makes the Lorain project the subject of comment in this vein:

When men of the business capabilities of the gentlemen named [Messrs. Moxham and Johnson] find it to their advantage for reasons sufficiently set forth to withdraw from the acknowledged center of the iron and steel business for new fields of operation, it is high time to seriously consider their claims of advantage with a view to considering the effect on

the future of this district. With the cost of maintenance and like expenses equal, the question hinges chiefly on the ever present obstacle of high freight rates on the natural products which enter into the proposed products of this new plant, and hence their position under prevailing conditions, that in an era of narrow margins they will be certain gainers over the Pennsylvania manufacturer, is worthy of most careful consideration by the latter. It may justly be regarded as a rather severe commentary on the progressive tendencies of our manufacturers that while they are neglecting the most bounteous opportunities for placing their supremacy away beyond question, by the utilization of advantages within their grasp, such giant rivalries find it profitable to spring into existence elsewhere.

Whether the ship canal will place the supremacy of the Pittsburg district "beyond question" is a matter about which there will be difference of opinion. The significant fact about the above is the prominence given to the indications that Pittsburg's supremacy in steel-making is threatened by the developments in Ohio.

THE Treasury Department statement of October imports of iron and steel to the United States shows considerable increase over October, 1893, particularly in tin and terne plates. The comparative table follows:

IRON AND STEEL IMPORTS FOR OCTOBER AND TO OCT. 31 IN 1894 AND 1893 —GROSS TONS.

	October.		10 mos. ending Oct. 31.	
	1894.	1893.	1894.	1893
Pig iron	1,601	616	12,770	51,838
Scrap iron and steel	54	165	1,666	6,005
Bar iron	1,631	1,182	6,423	13,425
Steel and iron rails	2	.....	70	2,888
Cotton ties	.....	206	50	1,666
Hoop, band or scroll iron	.....	45	805	987
Ingots, blooms, etc	1,517	710	6,844	25,037
Sheet iron and steel	2,529	1,580	24,920	34,025
Tin plate	24,005	11,521	176,844	227,948
Wire rods	2,221	2,490	17,956	30,476
	33,560	18,515	248,348	394,295

The iron ore imports in October were 18,895 tons, against 14,227 tons in October, 1893. For the ten months ending Oct. 31, 1894, the total of iron ore imported was 131,815 tons; for the same period last year, 501,345 tons.

PRICES on cast iron pipe from Northern foundries have been low enough to put considerable pipe from the States upon the Canadian market. A Toronto importer refers to the fact that Canadian manufacturers have found it almost impossible to meet this competition of late, even with a protective duty of 50 per cent. And this protection is increased moreover by the habit of the Canadian customs officers, of adding to invoice figures. If the invoice calls for 50 and four 10s, the customs authorities make a valuation equivalent to 50 and two 10s or three 10s off. These facts are their own commentary on the severe strain American pipe foundries have endured the past year and their desperate struggle for business, whether at home or across the border. It is not to be wondered at, that effor s are made by bidders on municipal pipe contracts, to prevent a promiscuous slaughter at every letting.

Good Pig Iron and Billet Records at McKeesport.

Furnace A of the Monongahela Furnaces, McKeesport, Pa., the only one in operation at present, Furnace B having been out of blast some time for relining, produced in the week ending Dec. 23, on a mixture containing 44 per cent. Mesabi ore, 2,444 gross tons of Bessemer pig iron. The largest output for one day was 380 gross tons. The size of the furnace is 20′x80′. The Bessemer steel plant at McKeesport produced recently 782 gross tons of steel billets in two turns of 12 hours each. This is believed to be the largest product of billets ever turned out by one blooming mill in 24 hours. The Monongahela Furnaces operate as a department of the National Tube Works Co., the department embracing the blast furnaces and Bessemer steel works.

THE CAMPAIGN FOR EXPORT TRADE.

TO THE EDITOR OF THE IRON TRADE REVIEW:

Since the beginning of the agitation in trade papers two months ago, of the necessity of doing something to build up the industries of this country, by increasing our export trade with foreign countries, and in particular Spanish and South American countries, much attention has been given to the subject through editorials in the daily and trade press. Some time ago the Manufacturers' Association of Cincinnati took the matter up with much earnestness and, as already noted in your paper, arrangements have been made for a convention of manufacturers from all parts of the country in this city on Jan. 22. It is expected to form a national association of the manufacturers for a united effort to make our manufactures more extensively known in all countries. At a meeting of the Manufacturers' Association held at the Grand Hotel in this city on the evening of Dec. 20th, the following were determined upon as some of the matters to be considered in this convention:

1. To petition Congress to revive or re-instate the reciprocity treaties.

2. To devise ways and means to better handle and cultivate foreign trade by expositions, advertising, consular service, or all three.

3. To petition Congress to allow Americans to buy ships abroad to fly the American flag and carry our own merchandise instead of depending on foreign lines or tramp ships.

4. The formation of a National Manufacturers' Association to handle the above and other important questions.

The value and importance of our export trade are not appreciated by some of our citizens. To give some idea of its magnitude, let me state that the value of all exported products of this country for the year ending June 30, 1894, was $869,207,941, against $831,030,785, to June 30, 1893, an increase of $38,177,156. This makes a gratifying showing when we consider the unfortunate condition of industry in this country throughout the last fiscal year. The value of the exports of American manufacturers in the year ending June 30, 1894, was $183,910,547. Of this an increase is noticed of $2,480,000, in exports of manufactured cotton. Over $1,000,000 of the increase being in the trade with China alone. South American countries show a good increase, particularly in the trade to Brazil. The exports to British India show a much more significant increase—from $131,000 to $311,000.

As illustrating the great value of reciprocity, note the exports to Cuba last year. Agricultural implements, $130,000; passenger and freight cars, $271,000; rubber goods, $42,000; machinery, $2,792,000; cut nails and steel bars, $434,000; tools and engines, $375,000; wire, $321,000; boots and shoes, $114,000, and other articles amounting to $9,472,000 increasing the total from $9,000,000 in 1890 to $18,845,000 in 1893, or more than 100 per cent. This includes 800,000 barrels of flour. Some of the items in the shipments this year are: Flour, $2,473,805; lard, $3,625,345; corn $571,326; machinery, $2,094,508; carriages, $458,738; coal, $915,800; fruits, $106,975; manufactures of wood, $1,018,756.

The meeting of the Manufacturers' Association referred to above was largely attended and much interest was shown. Pointed speeches were made by Thomas P. Egan, chairman, Hon. Thomas McDougal and Wm. B. Melish, emphasizing the great importance of this enterprise. Several thousand dollars were subscribed toward the fund to entertain the guests who will be here in January. Letters and circulars have been sent out in great numbers, and many answers received favorable to the project. Prominent manufacturers here are receiving many letters seeking information concerning the convention. Indications thus far show that much interest is being taken in the matter by manufacturers all over the country, and from officers of the local Association I learn that indications favor a large gathering with a good prospect of 1,000 delegates being present—manufacturers, representatives of boards of trade, chambers of commerce and other organizations. It is to be hoped that the daily papers and trade journals throughout the country will call frequent attention to this matter and help to make the meeting a great success. Certainly the subjects to be considered merit the serious attention of manufacturers in every line.

J. P. G.

CHAIRMAN FRICK ON THE HOMESTEAD SCALE.

Chairman Frick, of the Carnegie Steel Co., furnishes for publication the following statement concerning the new scale of wages just made effective at the Homestead Steel Works:

"It is quite true that the so-called reductions at Homestead have been frequent, but as will appear from figures that I will give, the so called reductions were not reductions, but rather adjustments to conform to changed conditions in the method of manufacture. At none of our works have we been so lavish of money for improvements as at our Homestead works. During the last year and a half $4,000,000 have been spent in improving and adding to the capacity of these works. Outputs have been doubled in less than two years. As a consequence all tonnage labor had to be reduced to conform to the new conditions.

"For the first six months of 1892, when the Homestead works were operated under the Amalgamated Association scale of wages, the average earnings of every man and boy employed (and there are a great many boys) for every working day in the year was $2.43. At the commencement of the year 1893 wages were adjusted for that year and the average wages for every man and boy employed was $2.44 per day. Considering that the latter part of 1893 saw very bad business as compared with a very prosperous year (1892) it is remarkable, but true, that our men earned better wages in 1893 than in 1892.

"In January, 1894, amidst the worst times the steel business has seen for many years, but I regret to say has seen worse times since, the wages were again adjusted with the result that the average wages of every man and boy employed during 1894 averaged $2.24 per day (in some months of the year the average was much higher), or a reduction of about 8 per cent. It is expected that the present scale will give our men $2.20 per day for every working day in 1895. A careful calculation shows that the Homestead works ran 95 out of every 100 days the past year. It should also be remembered that the average as cited embraces many common laborers, whose smaller earnings have reduced the average very much. Our skilled workmen, of course, earn much better wages.

"Under the new scale heaters and rollers will average $5.50 to $7 per day. Other skilled labor proportionately. Common labor will not be reduced. This is really a readjustment to meet new conditions in method of manufacture. I might also state that we have reduced our rents and fuel proportionately. I take pleasure in saying that the ability of the company to maintain a higher average wage than most of its competitors has been largely on account of the success of improved machinery lately introduced by the general superintendent, Mr. C. M. Schwab, whose plans have been uniformly successful.

Mr. West's Method of Casting Round Test Bars on End.

TO THE EDITOR OF THE IRON TRADE REVIEW:

It is not the intention of the writer to make any apology now for the defective test bars which were obtained by members of the Western Foundrymen's Association Test Bar Committee described in their report of Nov. 21st, 1894, but he would only say that the last report has proved his ability as a molder to devise and present a plan that could insure positive results at the hands of any molder. To explain why the plan being now used was not first adopted would require more space than would now be allowed, but this will be fully considered later on. It will suffice now to describe the cause for the successful results now obtained. It consists simply in having the metal enter the molds through a form of gate which gives it a rapid whirling motion, causing the dirt which might mingle with the molten metal to be thrown by the centrifugal force to the central portion of the metal as it rises up into the molds, thus bringing any dirt which might be created through unskilled or careless work in molding, up to the top surface of the test bar. The writer would here say to all those that have endeavored to deride the principle of the round bar cast on end and make capital out of the report of the W. F. A. Testing Bar Committee, which was due to imperfect bars being obtained, that the round bar cast on end as supported by the writer, is daily gaining converts and the strong opponents to its advancement will be shortly compelled to acknowledge that its claim for recognition as a standard for relative tests are based on grounds other than mere hypothesis. The chairman of the Test Bar Committee has asked for additional members to be appointed on the committee at the writer's request, so as to give the system a most thorough and rigid test; and when the time arrives for final report I think that previous writings and discussions will have fully proven that the round bar cast on end is the only method which can be correctly adopted as a standard for relative tests. The difficulty which had existed in making the adoption of this system practical, being a question of flaws, is now wholly removed, and the supporters of the round bar cast on end, as an improvement for methods in testing, can now anticipate final success, as the first round was not the knock out, as many were led to believe.

THOS. D. WEST.

Copying Machine Designs.

When an American tool builder who wishes to sell tools in a foreign country finds his strongest competitor to be a concern which is building tools more or less exact copies of his own, and finds that his own distinctive type of tools are the only ones that are considered by the purchaser, it is natural for him to think that copying has injured him, and that if it were not for copying he would have had practically no competitor—a view of the matter which is quite apt to arouse some bitter thoughts, touching as it does the pocket nerve; but, after all, is it not possible that a broader view of the matter would be the better one? In which view the effect of the efforts of the foreign builder to introduce American designs and to educate the people of his country up to an appreciation of them would be considered.

In this view of the matter it becomes a question as to how much help the American may have received in getting upon a competing basis, not only for that particular contract but for others as well.

The influence of such a firm as that mentioned [Ludw. Loewe & Co., of Berlin, who recently brought out a universal milling machine, an exact copy of machines of that class shown by the Brown & Sharpe Mfg. Co., at Chicago], using in their own arms factories and recommending to others, tools and systems of manufacture known as and referred to by them as "American," must be very considerable and very favorable, and there can be no reasonable doubt but that Loewe & Co.'s London representative is willy-nilly, doing considerable work in England favorable to American tool builders.

There is a form or method of copying machine designs, which every one instinctively recognizes as discreditable to those who follow it. It is followed by some American as well as by some foreign tool builders, and it is a problem whether in the long run even this form of copying injures the originator of a design or a copyist of it most. At any rate that form of copying in which a machine is purchased of its originator and taken apart to have its pieces used as patterns for imitations of it, will always be justly condemned by honorable men.—[American Machinist.

REFERRING to the wage changes at the Homestead Steel Works the Pittsburg *Times* says: "The rollers and other well paid tonnage men suffer the heaviest reductions. Rollers on all mills will get 25 to 35 per cent. less than last year, and the skilled hands in the converting department have their wages cut 20 per cent. The readjustment is stronger in the open-hearth mills than elsewhere. The 200 employes there are reduced, it is said to 100, the 40 smelters cut down to eight, and all hands suffer a reduction of 33⅓ per cent. In one case a man's wages were reduced from $4.10 per day to $3; in another from $3.90 per day to $2.25."

The continuous billet mill at the American Iron & Steel Works, of Jones & Laughlins, Pittsburg, turned out 300 tons of 1½ and 2-inch billets in one day recently. At the same establishment two Bessemer converters produced 1,360 tons of steel in 24 hours.

THE War Department has awarded to the Kilby Mfg. Co., of Cleveland, the contract for making ten disappearing gun carriages for the ten-inch sea coast rifles. Fresh proposals have been issued for supplying nine or more of the same type of carriages.

WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Western Foundrymen's Association was held Wednesday evening, Dec. 19, 1894, at the Great Northern Hotel, Chicago, with the President, Geo. M. Sargent, in the chair.

Among those present were the following: George M. Sargent, Sargent Co., Chicago; D. L. Cobb, Sloss Iron & Steel Co., Chicago; C. A. Sercomb, Schwab & Sercomb, Milwaukee; W. T. Warner, Illinois Central Shops, Chicago; Jas. Fyfe, Pickands, Brown & Co., Chicago; E. H. Walker, Emerson, Talcott & Co., Rockford, Ill.; A. M. Thompson, Link Belt Machinery Co., Chicago; Jno. M. Sweeney, Chicago; Wm. N. Moore, Joliet Stove Works, Joliet, Ill.; J. Vrooman, Bloomington Stove Works, Bloomington, Ill.; C. E. Louis, Forster, Hawes & Co., Chicago; Jno. T. Rowlands, Wm. Gept, J. I. Case T. M. Co., Racine, Wis.; Wm. Wilson, S. Obermayer Co., Chicago; S. T. Johnston, Whiting Fdry. Equip. Co., Chicago; W. W. Messinger, Western Electric Co., Chicago; H. S. Vrooman, N. C. Fisher, Garden City Sand Co., Chicago; L. D. Rosenheimer, C. A. Hankle, Milwaukee Malleable Iron Co., Milwaukee, Wis.; John Bailey, Illinois Iron & Bolt Co., Carpentersville, Ill; R. F. Palmer, *Industrial World*, Chicago; B. M. Gardner, *The Iron Trade Review*, Chicago.

The secretary read the following letter from Mr. O. T. Stantial, chairman of the Committee on Test Bars:

GRAND RAPIDS, MICH., Dec. 18, 1894.

Mr. B. M. Gardner, Sec'y Western Foundrymen's Association, Chicago, Ill.:

DEAR SIR: I hardly think I shall be able to attend the meeting to-morrow evening. I have been called unexpectedly to Grand Rapids, and probably shall not get back before the last of the week. In regard to our report on test bars: We have concluded not to make a final report this month, but to continue our tests for two or three months more, and would like to have the President, Mr. Sargent, appoint, say, four or six additional members to the present committee, with the understanding that they shall be active members, and willing to take hold and do their share of the work.

Mr. West has offered to furnish us with an additional apparatus for casting test bars, so that it will not take so long a time to obtain results. I have only to say at present that with Mr. West's last style of gating and casting bars we have met with entire success in obtaining test bars free from flaws. You will remember that at our last meeting Mr. Sweeney was of the opinion (and many others also), that if we enlarged the runner in Mr. West's original method we should obtain better results, and bars free from flaws. It may be of interest to the members to know that I have followed out a series of tests, casting 12 bars with the old method using the small runner and 12 bars using a runner one inch in diameter, and find that there is no difference in the test bars, which with both runners showed a very large percentage of flaws. On breaking the one inch runners I found them to be perfectly solid at point of fracture, which would seem to bear out an opinion expressed at the last meeting by one of the members, who made the assertion that he believed the runners poured from the top would show better than the bars run from the bottom. These tests were made to follow out suggestions made at last meeting. Our present work is entirely upon Mr. West's last method, in which he uses the swirl gate, which method at the present time looks very promising to us.

Trusting that you may have a very pleasant meeting, I am,

Very truly yours,

O. T. STANTIAL.

The report was accepted and ordered placed on file.

The Secretary also reported that he had received a letter from Thos. D. West saying that he was anxious that the committee should continue their work on this line and asking that additional members be appointed at this meeting to carry forward the good results obtained.

Mr. Sercomb moved that additional members be appointed to the committee by the president. The motion was carried.

Mr. Moore: It seems to me that there is nothing to prevent each member of the Association becoming a committee of one and I think it ought to be done. We are all foundrymen and all melting iron. All that have access to testing machines should take up this work. If one has not a testing machine it does not help matters to put him on a committee. I would like to ask if the committee is limited to the method suggested by Mr. West?

Mr. Gardner: The committee was appointed to investigate round vs. square test bars.

Mr. Moore: If that is the scope of the committee there is nothing to prevent each one working on the thing. I chanced a short time ago to visit a neighboring foundry and accidentally saw lying there some broken iron test bars and asked about them. I found also that they had been cast on end and that there had been a number of tests made; and thinking that the matter would be of interest in connection with this work I ascertained some facts. I supposed the committee would make its report this evening and I made some effort to get a few matters together relating to that business. The facts that I ran on to accidentally consisted of a series of tests which were made at the Joliet Works of the Illinois Steel Co. and I am indebted to Mr. John Pettigrew, who has charge of the foundry at these works, for the results obtained. I have here several tables. The bars are round and in tensile tests are one inch in diameter and the figures are reduced to strength in pounds per square inch of area. There are two kinds of iron represented. The four bars poured from a single ladle are in the first table and they broke at 19,569, 19,811, 25,388 and 19,225. It will be noted that three of the bars broke between 19,225 and 19,811 and one broke at 25,388. This is notable because there is no such variation, no such erratic results, in the other tables. The bars, it must be borne in mind, were all poured from one ladle, and three broke at substantially the same load.

The second set of bars broke at the following strains: 25,897, 27,170, 25,856 and 25,782. The average breaking strain in these bars was 26,176 pounds. The strongest bar varied from the average 3 7 and the weakest bar varied from the average 1½%, which may be assumed to be a very satisfactory test, the four bars having been poured from the same ladle. There are also some transverse tests on these same bars. The first test broke at 2,208, 2,152, 2,160 and 2,258. The average was 2,193. The strongest broke at 3% greater strain than the average and the weakest at 2% less strain than the average. The second set broke at 1,811, 1,729, 1,760 and 1,789. The average was 1,772, the strongest 2% above the average and the weakest 2.3% below the average. I was interested to get these figures and wished to know just how these bars were made and formulated a few questions which Mr. Pettigrew has been kind enough to answer in detail, as follows:

"Has a round bar cast on end always been your standard?"

"We always used square bars until we saw Mr. West's paper in the published procedings of the Western Foundrymen's Association.' (Showing that the work of the Association has been spreading in places we know not of.)

The next question was as to the pouring of the bars and his reply was that the bars were from two taps of the same heat. It will be noticed that these bars varied much in strength, the strength of one bar being very much greater than the others. They were poured from the same grade of iron. He said that in every case the molds were green sand molds and that they were poured on top.

I next asked if there were any other bars that were poured and not tested.

In answer he says that there were no other bars that were cast at that time which were not included in the tests. The tests cover all the bars that were made.

In answer to my question whether he considered round or square bars the better, he replied that he was not in a position to say yes or no, but that he favored the round bars, as the fracture showed a more uniform grain. Mr. Pettigrew is an old foundryman of Scoth birth and a very practical man and I regard his judgment of some weight. He told me I was quite at liberty to use this correspondence as I might see fit, as he did not want to hide his light under a bushel.

It is quite possible for any one to make tests in his own manner, as these were made, to ascertain facts which will go a long way toward establishing the value of the round test bars. I have samples of these bars which were broken and show the gating, which was simply a large square cut at the top of the bar with no special arrangement as to skimming it or anything else, and of the sixteen bars that are shown here only one of them is reported as having a slight

flaw in the fracture. We all ought to take up this work and follow it whenever we can.

Mr. Sweeney: I would like to ask Mr. Moore if he knows the distance between supports in these tests?

Mr. Moore: I do not, but I am very certain that it was the standard 12-inch.

Mr. Sweeney: That the breaking average was 1,700 pounds led me to think that it was 24-inch center.

The Secretary read the following letter from Mr. M. N. McLaren, Jr., of the Edward P. Allis Co., Milwaukee, Wis.:

THE EDWARD P. ALLIS COMPANY,
Machinists and Founders,
MILWAUKEE, WIS., Dec. 5th, 1894.

To the Secretary of the Western Foundrymen's Association, Chicago, Ill.:

DEAR SIR: At the last meeting of the Western Foundrymen's Association, the committee on test bars made its report. The object of this committee, as I understand it, was primarily to accumulate facts which might determine if possible, the best, and therefore the standard form of test bar to be used in general foundry practice. This committee performed its work faithfully and produced as the fruit of its labor, a series of tests with round bars cast on end and square bars cast flat. These data were good enough in themselves but were not sufficient to warrant the deduction of a single conclusion. Notwithstanding this fact, Mr. West undertook to prove that he was justified in assuming the round bar cast on end to be the best adapted for general foundry use, and furthermore, that it might be made to indicate accurately the absolute strength of the material so tested.

In the rambling discussion which followed, the original proposition of the association was almost forgotten; viz, to establish, if possible, some standard form of test bar. If a letter, with this proposition sincerely in mind, may not be out of place, the writer begs leave to submit the following:

First of all, can accurate data for the absolute strength of cast iron be obtained by a transverse test? Obviously it can not. The mathematical formula on which the conversion from strength in flexure to strength in tension is based, depends primarily upon the assumption that the material is absolutely homogeneous throughout. The slightest deviation by the material under test, from this assumed condition, causes not merely a slight error, but totally vitiates the result.

Every foundryman knows that there is no such thing as absolute homogeneity in cast iron and therefore can see at a glance that the formula can not be applied correctly. If farther proof is necessary, the records of transverse tests may be converted into tensile readings and compared with tests of the same qaulity of metal, made directly in tension. The results will prove astounding. Here is an illustration:

A few weeks ago I tested a square bar of white iron, 1″x1″x12″ between supports, which broke at 3,950 lbs. Converting this result, by the formula, into tensile strength, the metal shows a tenacity of 71,100 pounds per square inch; or dividing the result by the factor 1.4, according to C. Bach, the German engineer, we still have 50,780 lbs., tensile strength. The absurdity of this result is apparent.

Since the tensile strength is only one where the lack of homogeneity does not affect assumption of the formula used in calculating the strength of material, it must be the only trustworthy test approximating the true *absolute strength.* But tension machines are delicate and expressive—the time taken to test a piece in tension is necessarily long and this method is therefore generally conceded to be impracticable for ordinary foundry use.

The proposition now, is just this: Tensile tests are impracticable in the foundry, transverse tests are convenient but utterly untrustworthy so far as accurate *absolute* results are concerned.

Can we make transverse tests answer all purposes in a foundry? In most cases I say "Yes." In the first place, the foundryman is not an engineer and therefore need not figure on *absolute* strength of material.

A comparative test is all he needs and all he would ever use if he has every other appliance at his command. Now, since the results of a transverse test can only be comparative anyway, it can make but little difference what the shape of the bar may be, or in what position it is cast, *provided* the conditions of casting and testing are always the same.

It is a well known fact that bars cast flat and tested with the copeside up, break at a higher stress than those tested with the cope side down. There is no mystery about this—cast iron is stronger in compression than in tension, therefore if we put the side with the poorer metal in compression and the better metal in tension, we strengthen the weakest part of the bar and get a higher result thereby. But as long as comparative results are all that are sought it can make no difference whether the bars *might* break at a different load if turned on a different side, provided they *are not turned* on a different side.

To get a test bar that is absolutely homogeneous throughout is an impossibility under any circumstances and to endeavor to approach homogeneity by casting the bars round, so as to turn off the skin or in casting them on end to avoid other irregularities, is a superfluous refinement, where there are so many other conditions over which there can be no control and which may affect the *absolute* result sought. It would be as reasonable to pace off a mile or two, assuming that a step was exactly three feet, and then to measure the last fraction of a step with a micrometer and give the whole distance down to ten-thousandths of an inch.

When the United States Government or any thorough mechanical engineer makes specifications for a certain strength of material, they are always based on tension tests and always will be. And when any question arises as to the fulfillment of any such specification, it will aiways be decided by a tension test, no matter what the refinements of the foundryman's transverse test may be.

It, therefore, seems to me to be superfluous to go on refining a method for testing in the foundry which at best can only be comparative and which, if conducted in any of the ways now used, continuously and under the same conditions, will give results uniform enough to base comparisons upon.

What can refinements amount to under any circumstances, when the whole scheme is only a rough comparison, and why should the foundrymen bother themselves about perfecting a system, which, when perfected even along the lines Mr. West maps out, would not be accepted by a single mechanical engineer in the country as a determining test for *absolute* results?

Yours very truly,
M. N. MACLAREN, JR.

Mr. Sweeney: Mr. McLaren's ideas seem very much in point. I take it that all the foundryman finds necessary is to make comparative tests of different mixtures. That is the idea; that was the starting point. In order to make these comparisons most beneficial to himself he should have the conditions as nearly alike as possible. If the iron cast on end gives better conditions of regularity to himself, that is what he should adopt. The question was not whether the round test bar was a standard to be accepted by engineers for formulas, but which was the best shape of test bars for the foundryman himself in arriving at his best mixtures.

Mr. Sercomb: What we are getting at in the matter of test bars is the relative strength of those cast on end and those cast horizontally. To the foundryman it is a mere nothing, only for his information. What we want to know is the strength, as I take it, of the iron with the same mixtures.

Mr. Sweeney: Mr. Sercomb says that the question is, What is the difference in strength shown between round and square test bars? That is not the idea. It is not which shows the greatest strength, but which is the best for the foundryman to arrive at results. If the round bar cast on end has less flaws and runs more regular than the square bar cast flat, that is what the foundryman wants.

The following candidates for membership were unanimously elected: Heman R. Powers, Moline Malleable Iron Co., St. Charles, Ill.; Edward J. Fowler, Supt. Fowler Foundry Co., Chicago; Emerson Talcott & Co., Rockford, Ill.; and Milwaukee Harvester Co., Milwaukee, Wis.

The Secretary read a paper on Machine Molding by Harris Tabor. It will be found in another column.

The Secretary showed two large drawings of the Tabor molding machine, and said that he had received a letter from Mr. Tabor saying that the drawings were one-half the size of two of the smaller machines.

Mr. Geo. M. Sargent: I think it is the sense of the Association that we shall not take up any machine or any invention for the purpose of advertising it. I would not want this Association to advertise any machine so far as the machine is concerned, but the question is whether molding by machine cannot be made more economical than by hand. We have never had any difficulty in getting men to run the machine, and we find it a great advantage in making brake shoes to do the molding by machine. I think it is looking in the right direction to see how we can get our expenses down to the lowest possible point regardless of labor strikes or anything of the kind.

Mr. Warner: Any foundryman with a machine that makes duplicate castings and can turn out double the number could show a large saving. But to the foundryman with a jobbing-shop it would not pay. I do not think the percentage of saving is quite as large as Mr. Tabor says, but there is certainly a saving of one-third in the general run of the work.

Mr. Sweeney: There are lots of people that are not familiar with molding machines. I like to know their weak points and get the benefits. Mr. Tabor suggests that they can be extended to a use that has not been contemplated. I thought it would apply to small castings rather than to the casting of which you are only making a single piece. That view has been entirely eliminated from my mind since reading this paper. It is a question of molding machines and this is one type of a machine. I do not care what kind of a machine a man brings in here if this organization can get information we did not have.

Mr. Rowlands: I must say I have not had much experience in these machines. I have an entirely different rig in our shop. I was very glad when I read the notice of the meeting that we were going to discuss this question. I am thoroughly convinced that we have got to put in machinery. Other concerns that compete with us are doing it and we must do it also.

Mr. Sargent: We make as large castings as car couplers on our machine. We have a special machine for this work.

Mr. Rosenheimer: Our experience with molding machines has been very slight. I have tried one or two machines and we have not been very successful in operating them. I have not tried the Tabor machine, although I think where one has duplicate castings to make they are the proper machine. We have a Reynolds machine that I am working on certain castings and they can be produced at one-half the cost of those made by hand. I intend to put in a few machines on trial. I have taken up the matter with the Tabor people. There are a number of castings that we have to make by the hundreds of thousands. A piece workman's price would be too high. It is not necessary that the operator should be a molder. They are really boys ranging from 17 to 18 years of age, and their work is just as satisfactory as a man who has been a molder for 10 or 15 years. After the new machines are in I shall be pleased to give the Association further information on the subject. I shall give them a good thorough trial and keep an account.

Mr. Moore: We have had a little experience with a very simple molding machine and that is the Reynolds machine. It is hardly entitled to the designation of a machine. It performs but a small part of the function of molding. Our experience with it has been that it is adapted to make small castings in very large quantities. It is generally regarded as being of value where the work can be made by shop help. The machine that we have before us is really entitled to the designation of a machine. It is a class of machines that is not generally used and about which many of us know very little. I think that most of us who have been aware of such machines being used have generally associated them with the work that is represented on this machine before us. It seems to me that if those who have had experience would give us suggestions it would be of exceeding value.

Mr. Thompson: I have been in shops where they have been used to a very large extent and have made my own observations. I have in mind the remark that Mr. Sweeney made that his conception of the machine was that it could only be of value where a large number of castings were to be made, but that he implied that castings could be made to advantage in limited quantities. Castings cannot be made in small quantities profitably on a molding machine. There must necessarily be orders that run into the thousands before they can be employed to any advantage. It is very costly getting up the patterns. The stripping plate is very costly. It takes a long time to make a stripping-plate to fit the patterns. The machine itself is a costly article. In order to pay the interest on the investment and power to run it, it is necessary that the production should be at least twice as much as the ordinary molder would make. But on castings, such as the drawings show, I believe it to be a good thing.

Mr. Moore: May I ask Mr. Thompson to make an estimate on the cost of preparing a stripping-plate, and patterns; that is, approximately?

Mr. Thompson: I should think it would take a machinist about four days to finish up the stripping-plate including the filing down to fit the patterns and fill out the patterns to fit the machine.

Mr. Moore: Then you would estimate the cost of the stripping-plate and pattern not to exceed from twenty-five to forty dollars?

Mr. Thompson: About that.

Mr. Rowlands: In regard to stripping-plates I took particular notice of them as made in another foundry and I think they can be made very cheap. It is simply a matter of going around the pattern and this can be done very easily with type metal.

Mr. Walker: We have used something that I could hardly consider a machine. In fact the Tabor machine is the only machine that can be considered an out-and-out molding machine. We have devised several machines in our foundry that give us very satisfactory results. The cost of fitting up the patterns is not much more than for any mold. The plates are simply made and enough space is left to hold type metal.

Mr. Sargent: If there is no objection, I will have our general manager make up a statement as to the cost of patterns and what our machine has done.

Mr. Thompson: In speaking of the cost of the stripping plate I had reference to the iron plate complete. I think a plate filled up with type metal that would have to be changed often would be liable to get broken.

Mr. Sargent: We have a new kind of flask that can be taken apart and easily made longer or shorter and I think it will be a great deal of saving to us.

Mr. Sweeney: I was in hopes if I kept quiet long enough I would find out what I wanted to know. I said my impression originally was that a molding machine was adapted to, not large quanties, but I mean a number of small pieces put in one flask, rather than where one piece could be put in one flask. What I want to know is if the molding machine would be equally useful if there is one large piece filling up the flask as if the flask was filled with small pieces.

Mr. Sargent: We have one machine for moldiug couplers which weigh about 200 pounds. I shall be glad for any one here to go over to our foundry and see our machine. I think we make from three to four hundred brake shoes a day.

The meeting then adjourned.

THE firm of Hollis & Emmerton will be dissolved on January 1, 1895, and Mr. H. L. Hollis will have an office in The Rookery, where he will, in the future, devote himself to the business of mining and metallurgical engineering, and reporting on mining property. The chemical laboratory of the firm at 1232 The Rookery, Chicago, passes into the hands of Messrs. Robert W. Hunt & Co., the well known testing, inspecting and consulting engineers, who will maintain the high reputation for work heretofore sustained by Hollis & Emmerton. The chemical laboratory of Hollis & Emmerton at Cleveland will be conducted by Mr. F. A. Emmerton, who has heretofore managed the Cleveland end of the firm's business.

A RECEIVER was appointed on Dec. 10, at Cincinnati, for the Spathite Iron Co., of Nashville, Tenn., who have been operating the furnace at Florence, Ala. It is understood that the receivership is to be only temporary, as arranged by Col. Thos. Sharp, president of the company, in connection with the bondholders and principal creditors. It is reported that the liabilities will be raised and the furnace put in operation at an early date.

MACHINE MOLDING.*

BY HARRIS TABOR.

A careful analysis of the cost of castings will show that the two important items of expense are pig iron and molder's skill. In a majority of cases the cost of iron is greater, but often more money goes to the molder than to the pig iron dealer. Occasionally heavy and inferior castings are made in which the cost of molding is not so important, but in all cases it is great enough to warrant reduction if possible. Pig iron, sand, fuel and foundry supplies in general, are merchantable and are bought from the lowest dealer. There is not a foundryman present who will not give audience to the pig iron merchant, if he come with lower prices; or to the coke dealer, if he promise a ton of fuel for a trifle less than the cost ledger has been showing; or to the supply man who will deliver sand at a few cents per ton less than the ruling price. All these are commercial "soft snaps" for which you are looking, and they appeal to you; they mean a better margin of profit or an opportunity to further skin your competitor by quoting lower prices; and possibly such reductions may be the means of transferring the debit side of profit and loss account to the credit side. You watch the market with avidity and are quick to take advantage of all opportunities to lower your cost account by buying for less than you have been paying. If you can purchase a cupola that will save a few cents per ton in the cost of melting, you are pretty sure to give the order; the crane builder may count on an interested listener if he can offer any promise of reducing, however small the amount, the unskilled labor cost. But the second item of cost, in importance, the molder's skill, is rarely considered except by a reduction in wages, and where the union is strong such reduction usually means a struggle.

You will sit before me this evening and listen courteously to all I say on the subject of machine molding, but if many of you had been approached on this subject, in your own office, the chances are you would have pleaded any sort of business to escape being bored. This is a question in which some of you have but little faith and the lack of faith is made plain when the molding machine manufacturer presents his side of the question. Why does this scepticism prevail? It is because nearly every one of you has met discouragements in the way of bad castings, from good molders, especially when commencing a new line of work with which your molders were not familiar. Such losses have made you doubtful, at times, of all methods of molding, and especially machine molding. Add to such experiences in hand molding the record of machines which might have done good work if sold with regard to fitness, but did not, and we have the real cause of much of the doubt which exists in regard to machine molding. We may go farther and cite the inborn prejudice of the average molder who has no faith in anything but his own rammer. Such men are often foremen of foundries, and when such is the case their whole influence is thrown against the use of machines. In some localities this prejudice is so great that it is difficult to overcome; in other sections the molding machine has become popular. Where it has been intelligently placed and used its success has been wonderful, and its future established beyond all doubt.

Success is contagious, and the fact that numerous foundries are doing machine molding with a decided profit is evidence that it is only a question of a short time when the molding machine will take the same place in a well equipped foundry that the milling machine and turret lathe have held for years in the machine shop. It bears the same relation to the foundry that these labor saving tools do to the machine shop, and the economy from its use is quite as great.

The foundry has always been comparatively free from machinery. If we except the blower, the rumbler and an occasional power crane it may be said that the foundry foreman and all his men have had no experience with machinery. This fact has educated these men into a dread of anything which operates independent of the hand, no matter how simple it may be. The manager, knowing this condition, hesitates to adopt new methods until success has been demonstrated elsewhere. On the other hand the machinist lives in an atmosphere of turning wheels and creaking belts; his whole training has been in the direction of making machinery do his work. Here we have the reason why the machine shop manager is eager to adopt anything which will reduce cost, when the foundry manager would hesitate. I will cite two cases to show how naturally the works manager will discriminate in favor of the machine shop. Several of our machines are doing excellent work in a foundry, molding castings which require machining. The cost in machine shop on certain castings not molded on machines was 28 cents per 100, which was thought too high, and a special tool was designed and built, at a cost of $3,000 to reduce the cost of 28 cents to 25 cents. The foreman of foundry said if they would give him another molding machine at a cost of $1,000 he would save 75 cents per 100 on the cost of molding these castings. Here a saving in the foundry might have been made 25 times greater than that accomplished in machine shop, at one-third the preparatory cost. In this case the foundry should have come first. The second instance refers to a machine put in last summer with the view to equipping the foundry. I will give as nearly as possible, the manager's words: "The least saving from the use of the steam machine is in molding small castings which require more time for core setting. On this work the steam machine does for two cents the same amount of work that we pay five cents for on hand machines, a saving of three-fifths. On larger work, which costs more to mold by hand, two cents paid on the steam machine gives us the same quantity of work that costs ten cents by the old method, a saving of five to one." When the suggestion was made that if he could save one-fourth that amount in the machine shop he would not rest until that department was equipped, he admitted the truth and said he intended to take care of the foundry also. He has since put in the second molding machine and is preparing for more. Such cases might be multiplied, did the need exist; they have been introduced to illustrate the hesitancy of the foundry to consider better methods.

All times are favorable to the consideration of economical systems if they possess merit, and the present especially. The phenomenal growth of this country has made demands upon its manufacturers which have encouraged competition. The result is that prices for all products have been falling until they are now at the lowest point ever known, with no prospect of a full recovery. There may be an occasional boom which will temporarily add to profits, but the prices of a few years ago are beyond recall. We have reached a lower level of values, and so far there has not been a corresponding reduction in cost. A return to normal conditions of trade will not add appreciably to selling prices for the reason that our producing capacity is ample for such demand, and we cannot expect a substantial advance until all shops are fairly filled. We must face the fact that old prices will not return and we must arrange our plants to suit the new era of values.

The problem is simple in statement but difficult of solution. Briefly stated it is this: Castings are being sold today at prices little, if any, above the cost of production if all the expenses of business are included. This is especially true of competitive work, made in quantities. The decade ending with '92 was a busy one in the iron trade, and was characterized by a gradual reduction in prices; this period will also be noted as one in which production was largely augmented by new foundries and additions to existing plants; in fact it was an industrial boom on declining prices. The tendency has been to help the decreased ton profit by increasing the tonnage. A good illustration of this condition is the cast water pipe trade. There has never been a year when the tonnage of cast pipe has been greater than during the past 12 months, and prices have never been so low; these low prices prevail for the reason that the producing capacity is ample for the great demand. Soil pipe manufacturers are doing a fair volume of business at prices which would have meant bankruptcy a few years ago.

It is not the purpose of this paper to discuss the cause of these low prices or to suggest a means of making them higher. I wish I could. They are here to remain longer than we want them and we must meet the new conditions by making the cost of production less.

The current quotations for castings make the question of labor-saving methods an interesting one. You cannot go on melting iron and pouring it into expensive shapes with the

*Read before the Western Foundrymen's Association, Chicago, Dec. 19, 1894.

present small margin of profit. You do not want to further reduce wages, and it is doubtful if many of you can. What, then, is to be done? Make the product per man greater, with the same effort, by some means, and eliminate the skill required to the greatest possible extent. You must plan with a view to getting greater results from the same physical effort. A little saving here and another there, no matter how small, must be considered. If the gain from these savings yields a larger per cent. on the cost of making them than the money invested in business returns at the end of the year, they should be considered seriously. A saving which seems insignificant in connection with one casting only, makes a pretty large aggregate at the end of the year. Such economies are in the right direction and will influence what we are all working for—dividends.

Merchandise, which enters into the cost of castings, has suffered equally in reduction of price. You cannot hope to buy for less, relatively, than you are now paying, hence you must look to your foundry management for cheaper methods. The molder's cost is the greatest you have to deal with, and should be considered first. This may be reduced in various ways—such as better patterns, flasks suited to the work, good follow boards, match plates and molding machines. I will consider only the latter.

The economy from machine molding is usually gauged by the saving in foundry cost over previous methods. This is only a part of the gain. If castings require machine shop fitting their uniform size, when molded on machine, makes the cost of such fitting less. One user of our machines reported that he was getting the work of ten molders from one machine, operated by two laborers, at a cost of $2.70 per day, and added that the gain in machine shop was nearly as great. In this case the castings were shaft boxes which required no fitting when cast true to pattern. The machine gave this truth—the hand molder varied the size of each mold with his rapping spike.

Quality has a commercial value. Castings uniform in size and neat in appearance command a better price or are more easily sold. Machine molded castings are usually more uniform in weight and neater in appearance than hand molded work. In one New England market machine molded sash weights sell for $2 per ton more than similar weights molded by hand.

Any system that will allow expansion and contraction of business with the least disturbance in shop management is economical. The capacity of a molding machine is gauged by the number of men operating it. If the flasks are not too large one man will run it economically; if more castings are needed another man may be added with good results, and so on until three, and often four men are working one machine profitably. These men have no skill beyond what may be acquired in a few hours, hence they are easily obtained. Here we have a producing capacity which may be set to match the demand without letting skilled workmen go, in depressed times, with the doubtful chance of getting them back again when needed. Briefly, our experience shows that a good power molding machine will make a minimum economy in the cost of molds, of one-half and a maximum of four-fifths, with an incidental gain in quality and foundry management.

What is the limit to machine molding? This question touches a subject that is as variable as human nature. In a general way it may be said that all patterns that will go in a two-part flask can be molded on a machine if there is enough persistence in the manager. It has been said that the limit of the milling machine and turret lathe is defined by the ingenuity of the tool maker. We might say the same of the molding machine. In a well organized foundry where the cost of molding is watched as closely as the pig iron market, the manager will put patterns on the machine just as long as machine molding is profitable, and when this is done he will be surprised at the shapes he is molding with unskilled help. On the other hand the manager who seeks to make all his gain by buying merchandise at the least possible cost, often getting goods of doubtful quality, will reach the limit of machine molding where a more progressive man has barely commenced. If you make a study of the cost of castings in other foundries than your own, you will see one manager getting 10 per cent. greater product, per molder, than another in the same town; if your investigation extend throughout the country you will discover even a greater difference in what constitutes a day's work in different foundries; and you will find where the cost of molding is less when special effort has been made, on the part of the manager, to help the men. Such influences effect the limit and profit of machine molding. What one man would unhesitatingly put on a machine and mold successfully, another may hesitate over until doubt carries the day. Where one man will make special effort to save 10 per cent. in labor cost, another will not be tempted by a gain of 50 per cent. if such gain mean a change in methods. The possibilities of machine molding are much greater than is commonly believed but these possibilities must always be just what the manager makes them, and no man can safely predict the largest measure of success without some knowledge of the manager's disposition.

You will ask: "What is the cost of patterns?" This question cannot be answered definitely, for the reason that cost varies with different patterns. It may be said, however, that a machine pattern, with stripping plate, always costs more than a like pattern for hand molding; but this pattern cost should be carried through the year, like any investment, to determine its real value, and the pattern which gives a ton of castings with the least pattern charge must be the cheapest. A pattern on a good molding machine will give from two to ten times more castings than can be obtained from a pattern in the hands of a molder—a gain much greater than the difference in cost of patterns.

An important factor in machine molding, and one that is not fully understood, is duplication of castings. We have always treated this question in relation to the number of castings to be made from one pattern, without reference to the cost of molding. This is a mistake. It follows that castings which are molded for a fraction of a cent each must be made in larger quantities, to give the required duplication for machine molding, than castings which cost one dollar per piece to mold; hence in discussing this feature we should bear in mind cost rather than quantity. If we do this, we soon discover that castings, heretofore believed to be beyond the reach of a power molding machine, are really the most profitable work that can be put on one. Nor should duplication be considered in relation to time. If you have a number of patterns, from each of which you make enough castings to keep a machine running one day per week, the conditions are favorable for machine molding, and a machine would be as profitable on such work as one running constantly on one pattern. The time needed for changing patterns is short, and the change may be made after the molding for the day is finished.

I have in mind a machine which is molding hydrant bases and 8-inch spigot end gate valve cases. On account of the difficulty in getting cores, these patterns are changed twice daily. This machine is what we term single; that is, it molds only one part of flask at an operation, thus making an additional change from drag to cope with each change of patterns—in all, four changes per day. Two molders operate this machine, with a third molder for core setting. These men handle the sand with shovels, set their cores, pour their molds, and, in fact, do all the work usually done by molders, and turn out a daily product of 70 molds. When these castings are molded by hand, seven are a day's work. Here is an actual gain, from one machine, of the cost of seven molders, and under conditions which have not been considered favorable from the common standpoint of duplication. If this machine were operated by two laborers, there would be additional gain enough to pay a good profit on its cost. The parties using this machine installed the first one somewhat over a year ago, and have since put in three more.

What has been said of duplication of patterns may be applied to flasks, if the molding machine is adapted to take different sizes and shapes. When there is enough work to warrant a full complement of flasks of one size, it is better to have them; but if your trade is better served, or economical conditions favored by molding in two sizes of flask daily, there is no reason why you should not. You may even change from square or rectangular flasks to round, if you keep within the ramming capacity of machine. This plan will not only keep down the number and cost of flasks where your work is limited, but it will insure your flasks being poured daily, and it will allow you to cover a range of work with one machine

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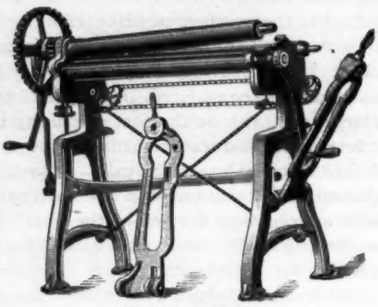
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which would require two of the type limited to one size of flask.

Power molding machines have been in use for a number of years, but until a comparatively recent date have not been seriously considered, except in a few special lines. There has been a two-fold reason for this: First, machines have been too special and have lacked the adaptability that is necessary to give the full measure of success: Second, they have not always been wisely placed. The latter fault may have been due to an enthusiastic salesman or lack of knowledge on the part of the buyer; but from whatever cause, it has worked against the use of power molding machines. If you have small screws to make in large quantities you would not think of purchasing a 30″ lathe to make them on, for your experience has taught you that such a tool, no matter how excellent, is not suited to the work. You must make these screws as cheaply as your neighbor across the way, and for less than you can buy them, which means the purchase of an automatic screw machine of modern design. In considering molding machines for your foundry you must discriminate quite as carefully. If you make the mistake of putting in a 24″ machine when your work calls for 12″x16″ flasks, your introduction to machine molding may be very unpleasant; and the man who attempts to sell you another machine will have a discouraging task. But if you select wisely the chances are that you will become an enthusiastic advocate of machine molding, in your own foundry.

The common acceptance of molding machines associates them with small castings which are cheaply molded. Herein may lie the cause of many failures due to lack of adaptation. Many of you have probably seen molding machines on small work giving a doubtful economy, when these machines might have earned their cost each year if molding larger and more expensive castings; in some parts of the country where competitive piece work has not reduced the cost of molding, these same machines which you saw molding with scarcely no profit, would give better results. In both cases machines might be put in under the impression that they were suited only to light work, when there were plenty of castings which they would mold to a better advantage.

Bench molding is cheap molding; it is usually done by apprentices and men trained only to this branch. This class of work is well suited to machine molding if the machine is quick in operation and does not call for too many operatives. You will not be satisfied with anything that will save you only the difference between the cost of skilled and unskilled labor; you must have something that will give an increased product, per man, as well. This a good molding machine will do, not only on your bench work, but on all castings suited to machine molding. But when you find a small machine that will mold a complete flask, 12″x15″, at one operation and will give you from 30 to 40 molds per hour, depending on core setting, from two men, you must not expect the same number of molds in flasks nearly twice as large, when this same machine is molding one part of flask at an operation. If you use the same care in considering the application of machine molding to your foundry that you give to improvements in your machine shop, the chances are that you will make no mistake. Fear of labor troubles has done much to prevent the use of molding machines. That this fear has been greatly exaggerated is proven by our experience. We have machines running very successfully in 13 States, in Canada, Mexico and New South Wales. The number placed in each foundry will vary from one to ten. We have watched this labor question very carefully and up to date we have not heard of an instance where opposition to the use of machines has been urged. We have machines all through the country operated by laboring men in union and non-union foundries, and strange as it may seem, we know that in four foundries the machines are run by union molders.

While the molding machine has not received its deserved recognition in some parts of the country, its use in other parts has established its future. It is beyond experiment, and may be classed with the electric crane as a necessary part of the modern foundry equipment. It may not be applicable in all cases, but you will find, by investigation, that the conditions necessary to its success have been greatly exaggerated.

WHILE the test of the Carnegie armor plate for the battleship Oregon, made Dec. 15, was unusually severe and the test plate was cracked, Secretary Herbert has decided that it fills the requirement of the contract. There was considerable complaint that the test was made with a Wheeler-Sterling projectile, which is a later development in shell than those which were the standard when the specifications of tests were furnished for the Oregon's 17 inch plate. The entire lot of 420 tons will be shipped at once to the Union Iron Works and put in place on the Oregon.

EMPLOYES of the Atlantic Iron Works, Sharon, Pa., want to start it on the co-operative plan.

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick.

GOVERNMENT ⁜ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Allegany County, Md.

Branch Offices:—No. 1 Broadway, New York, N. Y.: No. 222 So. Third St., Philadelphia, Pa.; Ferguson Block, Pittsburgh, Pa, Stowe, Fuller & Co., 195 Merwin St., Cleveland, Ohio.

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Rolling Mills, Steel Works, Blast Furnaces, Cupola Linings, Boiler Settings.

—All Shapes in Stock—

Our large capacity, 8,000,000 annually, and modern plant, enable us to handle contracts of any size promptly.

Ground or Calcined Clay in Sacks or Bulk.

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WESTERN AGENTS OF

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The leading BRICK of this country.

MANUFACTURERS OF

OHIO FIRE BRICK. ALL SHAPES IN STOCK.

The largest shippers of **FIRE BRICK** in the West.

Warehouse and Docks: 193-195 Merwin Street, CLEVELAND, OHIO.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

The Emerson Saw Co., Ltd., of New Alexandria, Va., will buy a boiler and engine, belting, shafting, pulleys, couplings, etc.

The North Georgia Mining Co., Cedartown, Ga., is in the market for a second-hand steam shovel in good repair and ready for work.

Excelsior Furnace at Ishpeming, Mich., is in the market for a second hand blowing engine. Name price and make. The management has for sale a second-hand No. 3 Gates crusher.

At the office of the Supervising Architect, Washington, D. C., sealed proposals will be received until 2 P. M., Jan. 15, 1895, for all the labor and materials required to furnish complete three steam boilers, boiler feed pump, injector, feed water heater, etc., for the new elevator plant in the U. S. Custom House, New York.

New Construction:—

Fire at the Hennessy Boiler Works, New Castle, Pa., caused a loss of $2,000.

The Williamsport, Pa, Wire Rope Co., will put up a building 268x80 feet. An engine house 42x26 feet will also be erected.

Preparatory to the erection of their new tin plate plant, the La Belle Iron Works, Wheeling, are tearing down their puddling furnaces.

The Berlin Iron Bridge Co., of East Berlin, Conn., has just completed a new boiler house for the Metropolitan Electric Co., at Reading, Pa.

H. A. Lozier & Co. will rebuild their burned bicycle works at Toledo, and 500 men are at work now. The plant will be completed in 90 days.

The Clinton Wire Cloth Co., at Clinton, Mass., has just completed a new boiler house. The roof is of iron, covered with the Berlin Iron Bridge Co.'s patent anti-condensation corrugated iron.

Ground has been broken for a large machine shop, which will supplant the old shop near the 33-inch mill at Homestead, Pa. The new shop will be fitted with all the latest devices. The railroad tracks will be built through it. The old shop will be torn down and the 33-inch mill enlarged. Changes are to be made also in the open-hearth mill.

Additions, Enlargements, Removals, Etc.:—

The Bridgeport Pipe Co., of Bridgeport, Ala., has begun the erection of a machine shop, 40x100 feet in size.

The Fairhaven Iron Foundry, of Fairhaven, Conn., have largely increased their melting capacity by the addition of a new Whiting cupola.

The plant of the American Brake Beam Co., at Waukegan, Ill., is being enlarged by the erection of a new building 200x60 feet, which will be used as a factory.

The Ellerslie Coal & Coke Co., of Winfred, W. Va., have let a contract for the erection of a block of 100 coke ovens at their plant. The concern will also put in a rope haulage system and will introduce mining machinery.

The Washburn & Moen Co.'s plant at Worcester, Mass., is to be enlarged by three additions to the rolling mill, to be respectively 12x108 feet, 20x60 feet, and 16x72 feet.

The town of Washington Court House, O., has offered the Ohio Southern a bonus of $50,000 to remove its shops from Springfield, O., to that town and the offer will probably be accepted.

Fires and Accidents:—

Cagnon & Freres' foundry, at Quebec, Can., was destroyed by fire lately, with a loss of $35,000.

The Champion Shovel Co.'s plant, at Phillipsburg, Pa., burned on Dec. 12, together with a large stock of goods. Loss, $7,000; insurance, $3,000.

The plant of the United States Standard Scale Co., at Newark, N. J., burned recently with a loss of $75,000, about one-third of which is covered by insurance.

General Industrial Notes:—

It is reported that part of the shops of the Michigan-Peninsular Car Co., Detroit, Mich., will start up shortly.

D. B. Dewey, of Chicago, has been appointed receiver of the Eagle Iron Co., of Spring Valley, Wis., which failed recently.

The Excelsior Iron Works Co., Cleveland, has executed a mortgage on its plant to the Glens Falls Insurance Co. for $35,000.

It is expected that the East Lebanon Rolling Mill Co., of Lebanon, Pa., will declare a dividend of 10 per cent. on January 1, as a result of the prosperous business enjoyed by the company in the past year.

In the Bessemer plant of the Bellaire Nail Works, Bellaire, O., No. 1 turn made 65 heats, or 313 tons of steel in one night recently.

Two rollers and four heaters, of the locked-out Demmler, Pa., tin plate workers have returned to work. There are now 120 men at work.

The new tin house of the Wheeling Corrugating Co., of Wheeling, W. Va., is nearly completed, but it is still uncertain when the plant will be ready for operations.

The furnace workers at Braddock and the Edgar Thomson Steel Works employes of the Carnegie Steel Co. were paid in full Saturday, Dec. 22, the total being about $75,000.

The Maryland Steel Co. has secured the contract for making and erecting the overhead electrical equipment for use in the Baltimore Belt tunnel. The work will cost about $80,000.

Some of the locked-out employes of the Demmler, Pa., and Irondale, O., tin plate plants are organizing co-operative tin plate enterprises. All the stockholders must be mill workers.

Three large steam hammers for heavy drops and regular forging have been shipped to the Heath Rail Joint Co., of Chicago Heights, Ill., by Williams, White & Co., of Moline, Ill.

D. L. Wray and Ira Wentzell of Bellwood, Pa., and C. M. Robinson of Altoona, have purchased the plant of the Robinson Machine Co., at Bellwood, for $4,000. The new firm will manufacture a heating system, and will start operations at once.

The assignees of the Crane Iron Co., Catasauqua, Pa., will dispose of three properties not covered by the general mortgage of the company, and then turn the plant over to a new company composed of the bondholders. That they may close up the business, No. 6 furnace has been blown out. No. 1 will stay in blast and No. 3 will be repaired and blown in by spring.

The Shaw Electric Crane Co., of Muskegon, Mich., has received orders for two cranes of 15 tons capacity and one of 10 tons from the Pharo Machine & Foundry Co., of Ansonia, Conn.

Recent month-records of leading wire rod mills: Beaver Falls mill, 7,013 gross tons of wire rods in 54 single turns; the Joliet mill, 6,817 tons in 51 turns; and the Oliver mill, 6,749 tons in 52 turns.

No. 2 furnace of the Lackawanna Iron & Steel Co., at Lebanon, Pa., which is now undergoing improvements, will be ready to blow in February 1. As soon as No. 2 is in blast, No. 1 will be blown out and enlarged and improved.

The Ohio Steel Co., Youngstown, has just placed an order with the Lloyd Booth Co. for the construction of a bar mill table 100 feet long. The table will be of the most approved pattern, and its construction will require about a month.

Kirkpatrick & Co., Ltd., Pittsburg, operating the Leechburg Iron Works, of Leechburg, Pa., have lately purchased the business of J. S. Ingalls & Co., of Troy, O., who have been making plainished steel for a number of years. The plant has been removed to Leechburg, and a number of important additions made, and operations were commenced recently. The product is known as "Craig Polished Steel," and has been made by Ingalls & Co., for eight years under the patents of Mr. Craig, who has charge of the manufactures at Leechburg.

Through Car to Wheeling.

Via Valley and Wheeling & Lake Erie Rys., leaving Cleveland at 11:00 A. M.; Akron, 12:05 noon; Canton, 1:08 P. M. Daily except Sunday.

GASOLINE ENGINES

Stationary & Portable

ALL SIZES.
Dwarfs in size and Giants in Strength.
Costs only 10 cents a Day per H. P. to run them, & scarcely any attention.
EVERY ENGINE GUARANTEED
Write for particulars and testimonials.
THE VANDUZEN GAS & GASOLINE ENGINE CO.
CINCINNATI, O.
Mention this paper when you write.

STEAM USERS

will do well to send for our pamphlet on

FUEL ECONOMY.

Mailed free to any applicant.

THE BRIGHTMAN STOKER CO.,

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Best Quality CARBONS At Reduced Prices.
BLACK DIAMONDS
FOR
DIAMOND DRILLS.

$14.00 Per Carat. $14.00 Per Carat.

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IMPORTER,
4 & 6 John St., New York.

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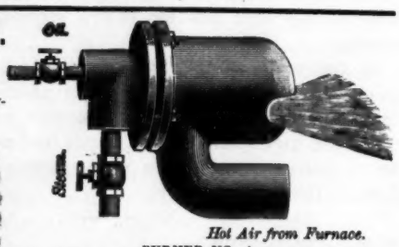
Gen'l Offices, 35 and 36 Cordova Bldg.,
INDIANAPOLIS, IND.
Acknowledged the best for Boilers, Forges, Furnaces, Ovens, etc. Write for Catalogues.

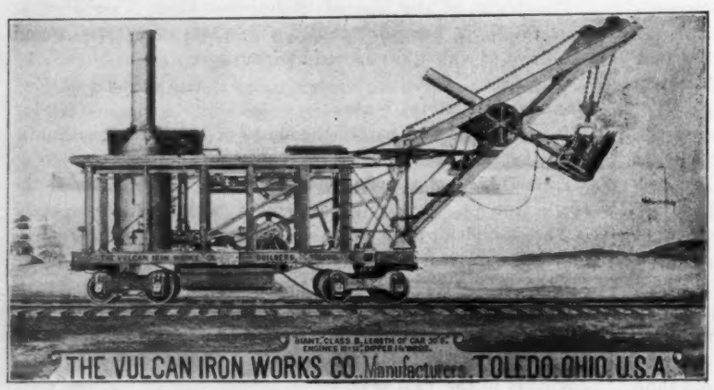
BURNER NO. 6.



BURNER NO. 4.

E. A. BOLDT, Sole Agent, Eastern States,
320 and 322 Broadway, New York, N. Y.
J. POWER HELY, Chicago Manager,
1405 Monadnock Block, Chicago, Ill.

NOTE.—If you are using oil as fuel, and are not getting good results, we would be pleased to send you our burners on trial. The oil in our burners can be atomized by either steam or air.



STEAM SHOVELS!

VULCAN IRON WORKS CO.,

TOLEDO, O., U. S. A.

There is no Steam Shovel on the market so well adapted to handling Iron Ore as our "Giant." We guarantee 2,500 tons in ten hours.

Our "Giant" has the record on the Mesabi Range.

Connellsville Coke Trade.

In the week ending Dec. 15 Connellsville coke production was 3,500 tons greater than in the previous week. Stock is accumulating, nearly all the operators in the region with the exception of two companies having many tons piled in their yards. The shipments in November fell off considerably from those in October, the latter being the largest in the history of the region, averaging 1,285 cars a day. The detailed report of the operation and output of the region for the week ending on Dec. 15, shows 14,337 active and 3,477 idle ovens, with a total estimated production of 146,852 tons.

The *Courier* says: "The future selling price of coke is still the all absorbing topic among the operators. They all think it ought to go up, but no one is willing to say with any degree of certainty that it will go up. The small producers are waiting on the big concerns to start the ball rolling, and the latter are reluctant to make the break until they are sure the figures they name will not be shaded. Consumers are beginning to make inquiry about orders for the ensuing year, as most of their contracts expire some time in January."

THE Board of Directors of the Westinghouse Machine Co., of Pittsburg, have declared a quarterly dividend of one and one-half per cent. on the preferred and common capital stock of the company, payable January 20, 1895, to stockholders of record December 20, 1894.

LIGHT, CHEAP, COOL, DURABLE,

COLLECTS NO MOISTURE FROM UNDER SIDE. NO DRIPPINGS.

Resists acids and gases arising from inside of FOUNDRIES, IRON WORKS, MILLS, ETC.

Litho-Carbon Paint for Metal Roof sand Sidings Bridges, Smokestacks, etc., covers more space than any other Paint; dries quick, won't crack, peel or blister; will stand a heat of 550° Fahrenheit. Send for 32-page catalogue.

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GALVANIZING
WORKS.
H. H. HODELL & CO.,
Galvanizing in all its branches, and Manufacturers of Rubber Buckets for chain pumps.
CLEVELAND, OHIO.

The Iron Trade Review
Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

The Reason Why

Economy of fuel, rapid melting, the production of a uniform grade and strength of iron is attained in the highest possible degree in the BLAKENEY CUPOLA FURNACE is comprehensively shown in the following cuts:

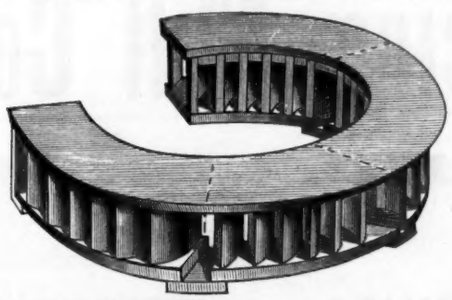


Fig. 1—The Combination of Sections of Tuyeres as placed in wall.

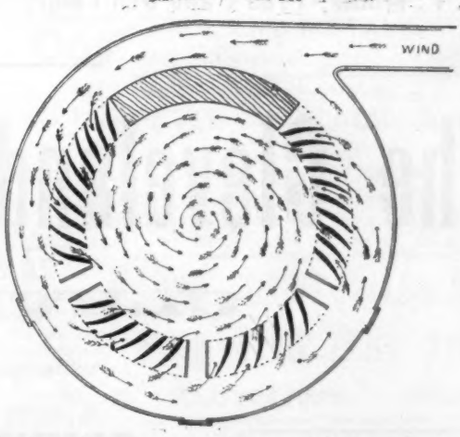


Fig. 2—Showing direction of Wind through the Curved Tuyeres.

Upon the manner of introducing the blast into the cupola depends the degree of combustion attained, consequently that form of tuyeres which will produce maximum results at a minimum cost is the great desideratum. We assert that this has been reached in the "Blakeney" tuyeres to a higher and more satisfactory degree than in any other device known, whether it be a combination of upper and lower tuyeres, a series of pipes, or the old-fashioned tuyeres; and we are certain that a little reflection on the part of any one familiar with cupola practice, will convince him that the projection of the blast through CURVED tuyeres will not only insure its penetration nearer to the center of the cupola, but its more even distribution to all parts of the cupola as well. It is upon this self-evident fact that we base our claim of the attainment of a combustion more nearly approaching perfection than by any other method. With better combustion it necessarily follows that there must be greater economy of fuel, faster melting, less "hanging up," and the production of a more uniform grade and strength of iron. In a word, the "Blakeney" cupola is a continual source of profit and satisfaction in a foundry, and to any one desirous of improving their melting facilities, or who are in the market for a new cupola, we shall be pleased to send a descriptive catalogue. We are quoting "hard time" prices and solicit the privilege of submitting figures. To those whose cupolas are being run at a daily loss as compared with the results attained in the "Blakeney," we desire to state that we are prepared to apply these patent tuyeres and air-chamber to old cupolas at a nominal cost when the shell is in good condition.

A FEW "STRAWS" SHOWING THE WAY THE BLAKENEY CUPOLA "WIND" BLOWS.

LANCASTER, PA., August 29th, 1894.

The Springfield Cupola Co., Springfield, Ohio.

GENTLEMEN: In answer to yours of the 27th inst. regarding the working of the Blakeney Cupola purchased from you in January last, we are pleased to state that since getting the Cupola in operation we have been in receipt of a number of inquiries from interested parties, and our reply has invariably been to the effect that the Cupola is giving us entire satisfaction. We never handled one that melts iron so rapidly, and for rapid work and satisfactory results with the castings we can cheerfully recommend it. Yours truly, THE HUBLEY MANF'G CO., F. H. Steacy, Sec'y.

FULTON, ILL., Aug. 29, 1894.

The Springfield Cupola Co., Springfield, Ohio.

GENTLEMEN: Replying to your favor of recent date we would say that it affords us pleasure to state that the No. 4 Blakeney Cupola bought of you last November is giving us just as good satisfaction as the Blakeney we had in use for fifteen years in our works at Tiffin, O. During this time we were familiar with cupolas of other makes, but knew of none which could give the good results attained in yours, consequently when we removed our plant to this city, and were in the market for a new cupola, we immediately communicated with you for the purchase of a new Blakeney. You may refer to us whenever the opportunity offers. Yours truly, THE MISSISSIPPI VALLEY STOVE CO.

THE SPRINGFIELD CUPOLA CO., Springfield, Ohio.

THE TABOR MFG. CO.,

—MANUFACTURERS OF—

AUTOMATIC MOLDING MACHINES,

For Sand Molds for Metal Castings.

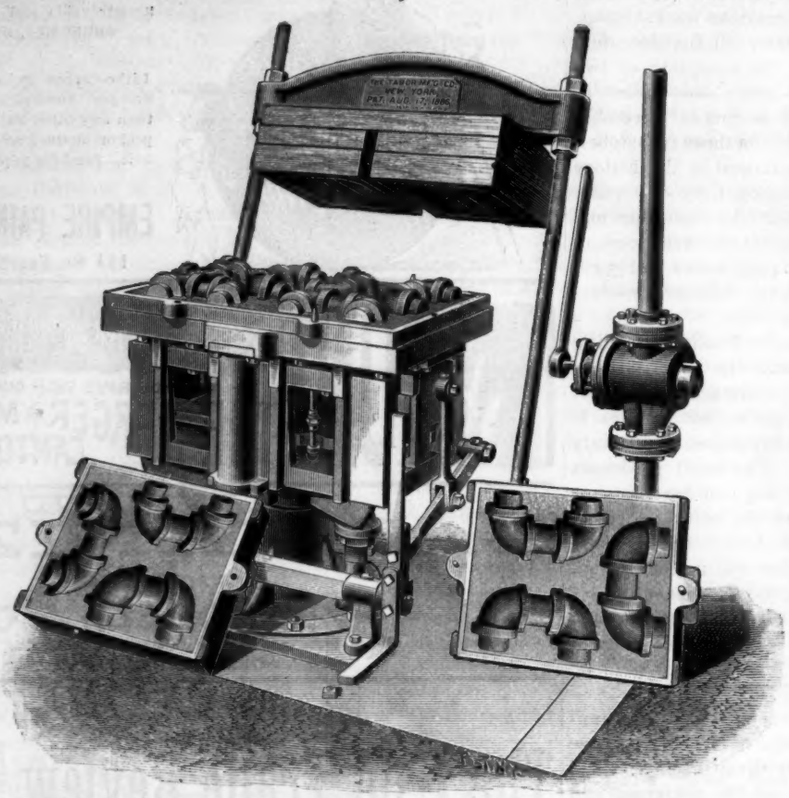
Note the advantages of the **only Power Molding Machine adapted to different sizes and shapes of flasks.**

Our 16″ Duplex will mold, working Duplex, both parts of flask 12″x16″ and all sizes below; this same machine, when working Single will mold flask 16″x20″ and all sizes under.

Our 20″ Duplex will mold, Duplex, both parts of flask 13″x18″ and all smaller sizes; working Single it will mold flask 18″x24″ and smaller sizes.

This feature allows a range of work by one of our Machines, which would require a number of any other type. This is of the greatest importance to Foundries.

The Milling Machine of the Foundry.



AUTOMATIC DUPLEX MOLDING MACHINE.

These machines are adapted to general castings when made in reasonable quantities.

The use of these machines is a guarantee of economy, greater quantity and better quality in castings.

Foundrymen who are interested in producing cheap castings of superior quality are invited to correspond with the Company and call at the works, Front and Franklin Streets, Elizabeth, N. J., and see the machines in operation.

The Turret Lathe of the Foundry.

113 Liberty Street, - - - NEW YORK, N. Y.

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FOUNDRY FACINGS,

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FOUNDRY EQUIPMENTS.

Importers of INDIA SILVER AND German Black Lead.

And the Celebrated C. F. M. Founders' Perfect Wash, and Heavy A. A. Pure Plumbago. Also Stove Plate Blackings which have never been beaten.

Write for prices on anything you may want. Trial orders solicited.

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MULTIPLE DRILLS.

Made to special order to suit any class of work.

Special arrangement of spindles. Photographs and details by mail.

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Barnes' Upright Drills.

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Lever and worm feed, back geared, self feed and automatic stop; with or without sliding head.

COMPLETE LINE HIGH GRADE TOOLS.

W. F. & John Barnes Co.,

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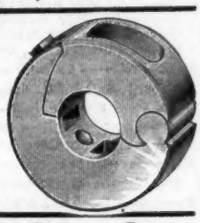
A small investment will carry an assortment of our

"SPLIT COLLARS,"

sizes to correspond with the shafting you use. They can be put on without disturbing pulleys or boxes. Write for circular.

THE GOUVERNEUR MACHINE CO.,

GOUVERNEUR, N. Y.



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DEALERS IN A FULL LINE OF

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No. 17 South Canal Street, Chicago.

Morse Twist Drills, Kearney & Foot's Files, Wiley & Russell's Lightning Screw Plates, etc, Billings & Spencer's Wrenches, etc.

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We are the only Steel Roofing Co. awarded Medal and Diploma for **PATENT CAP ROOFING** at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES IRON & STEEL ROOFING CO., - Chicago and Niles, O.

Moffet Portable Drill

UNSURPASSED AS A REAMER.

Weighs 48 pounds and drills from ⅜ to 2 inches diameter.

Runs with Steam or Compressed air.
Will Work in Any Position.
An Economical Substitute for Ratchet Drilling
Send for Circular.

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J. G. TIMOLAT

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SECOND-HAND MACHINERY.

9"x4 ft. foot Power engine lathe, screw cutting.
12"x6 ft. screw cutting engine lathe.
13"x5 Putnam plain feed engine lathe, rise and fall carriage.
16x6 Prentiss screw cutting lathe, rise and fall rest with chuck tools, etc. In fine order.
16x6 Pratt & Whitney plain feed lathe, compound rest. In A1 order.
18x6 New Haven lathe, screw cutting, rise and fall rest, with chuck.
20" Wood lathe, complete.
84"x20 ft. Niles lathe, triple geared.
3 speed lathes, 9, 11 and 16 swing.
10" Pratt & Whitney screw machine.
1" Prentiss wire feed screw machine.
12"x4 ft. 6 in. Warner & Swasey turret lathe, 1⅛" hollow spindle.
12"x6 ft. Lodge & Davis plain Fox lathe, chuck and slide rest.
16" Windsor Fox Monitor with swivel and chasing bar.
10x10x2 Hendey hand planer.
16x6x3 Pease Planer.
32x32x9 ft. Pond planer, two heads.
18" Pratt & Whitney level drill.
3½" back geared automatic drill.
Forges, chucks, shafting, hangers, pulleys, etc.

Send for photos and full list of second-hand and new tools. Correspondence solicited.

PRENTISS TOOL & SUPPLY CO.,

59 S. Canal St., CHICAGO, ILL.

SECOND-HAND MACHINERY

One Iron Planer 60"x60"x20', 2 heads.
One " " 40"x36"x12', New Haven make.
One " " 28"x24"x5', " " "
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And other sizes.
One Engine Lathe 60"x18' 6" bed, new, Pond make
One " " 54"x24' bed, 2nd hand, " "
One " " 48"x18' " " " Putnam "
One " " 34"x8' " " " " "
One " " 26"x10' " " " " "
And various sizes.
One 28" Back geared, self-feed Drill, New Haven make, A 1.
One 28" Plain Drill, New Haven make, A 1.
One 40" Back geared, self-feed Drill, New Haven make, A 1.
One No. 18 Bliss Press, A 1 order.
18"x12" Self-Contained High Speed Engine.
We can furnish anything in the line of Machinery

NEW YORK MACHINERY DEPOT,

178 Broadway, New York.

E. C. POPE,

COMMISSION DEALER IN

Iron Ore, Pig Iron

AND METALS.

Cleveland, - Ohio.

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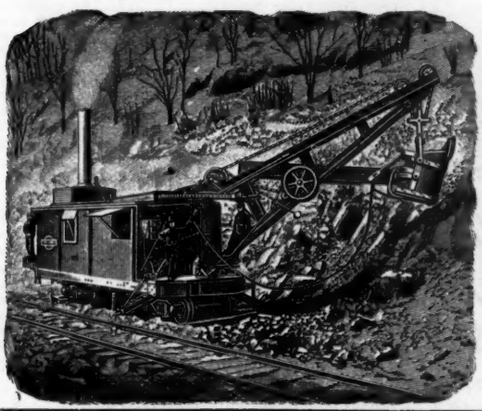

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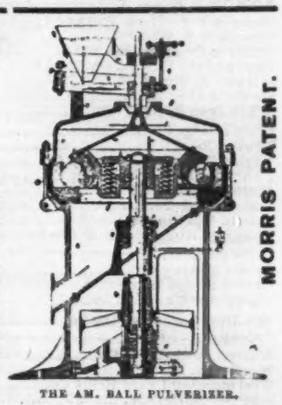

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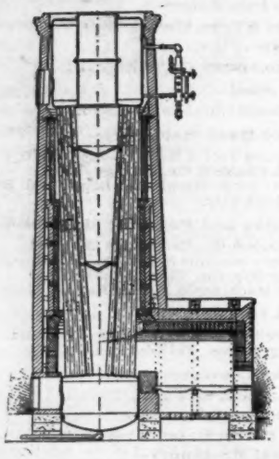

VERTICAL WATER TUBE BOILER

Best in the World.

MANUFACTURED BY

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Mansfield, Ohio.

Highest Efficiency, Lowest Price.

Leads all makes of boilers in economy, capacity, ease of examination, cleaning and repairs. Send for description, tests, references and estimate before you purchase.

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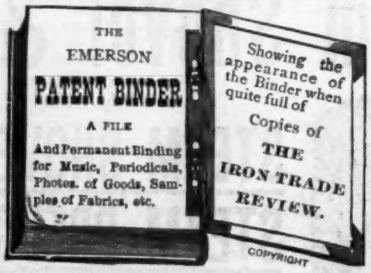
933 Rookery, CHICAGO, ILL.



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ENGINEERS.

Mining Reports and Estimates. **Spanish-American Business a Specialty.**

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	3.00@ 3.35
No. 1 Bessemer hematite	2.75@ 3.00
Hematites No. 1 non-Bessemer	2.00@ 2.50
No 1. Specular, non-Bessemer	2.35@ 3.00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$10 65@$00 00
No. 1 Strong Foundry	11 25@ 11 65
No. 2 Strong Foundry	10 25@ 10 65
No. 1 Gray Forge, red short	9 50@ 9 75
No. 2 Gray Forge, neutral	9 25@ 00 00
No. 1 American Scotch	11 65@ 00 00
No. 2 American Scotch	10 65@ 00 00
Lake Superior Charcoal	13 00@ 13 50
PITTSBURG:	
No. 1 Foundry	$11 25@$11 75
No. 2 Foundry	10 25@ 10 75
Gray Forge	9 50@ 9 75
White and Mottled	9 00@ 9 25
Warm Blast Charcoal	18 00@ 19 00
Cold Blast Charcoal	22 00@ 26 00
Bessemer	10 65@ 00 00
CHICAGO (reported by our representative:)	
Lake Superior Charcoal	$13 00@$14 50
Local Coke Foundry No. 1	10 25@ 10 50
Local Coke Foundry No. 2	9 75@ 10 00
Local Coke Foundry No. 3	9 40@ 9 65
Local Scotch Foundry No. 1	10 25@ 10 50
Local Scotch Foundry No. 2	9 75@ 10 00
Local Scotch Foundry No. 3	9 50@ 9 75
Southern Coke No. 1	11 00@ 11 25
Southern Coke No. 2	10 25@ 10 50
Southern Coke No. 3	9 75@ 10 25
Southern No. 1 Soft	10 25@ 10 50
Southern No. 2 Soft	10 00@ 10 25
Southern Silveries No. 1	11 50@ 11 75
Southern Silveries No. 2	11 25@ 11 50
Jackson Co. Silveries	15 00@ 16 00
Ohio Silveries No. 1	14 00@ 14 50
Ohio Silveries No. 2	13 00@ 13 50
Ohio Strong Softeners	13 00@ 13 50
Alabama Car Wheel	17 50@ 18 00
Malleable Bessemer	10 50@ 11 25
Coke Bessemer	11 25@ 11 50
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$ 9 75@$10 00
Southern Coke No. 2 and No. 1 Soft	9 25@ 9 50
Hanging Rock Coke, No 1	12 00@ 12 50
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	14 00@ 14 55
Jackson County Stone Coal No 1	14 50@ 15 00
Southern Coke, Grey Forge	8 50@ 8 00
" " Mottled	8 25@ 8 75
Standard Alabama Car Wheel	15 75@ 16 50
Tennessee " "	15 50@ 16 75
Lake Superior " "	14 00@ 14 00
BUFFALO (reported by Rogers, Brown & Co.)	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$11 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	11 75
Ohio Softener No. 1	11 75
Jackson Co. Silvery No. 1	15 75@ 16 75
Lake Superior Charcoal	13 75
Southern Soft No. 1	11 25
Hanging Rock Charcoal	18 50
ST. LOUIS (reported by Rogers, Brown & Meacham):	
Southern Coke No 1	$10 75@$11 25
Southern Coke No. 2	10 00@ 10 25
Southern Coke No. 3	9 75@ 10 00
Southern Gray Forge	9 50@ 9 75
Southern Charcoal No. 1	14 00@ 14 50
Missouri Charcoal No. 1	12 50@ 13 00
Ohio Softeners	14 00@ 14 50
Lake Superior	15 50@ 16 00
Southern	16 75@ 17 00
Connellsville Coke, St. Louis	4 50

OLD RAILS AND SCRAP METAL.

[Prices paid by mills.]

GROSS TONS	
Old iron rails	$12 50
Old steel rails	10 00
NET TONS	
No. 1 R. R. wrought scrap	$ 9 50
No. 1 wrought scrap	8 50
No. 1 Machine cast scrap	8 50
Iron axles	15 50
Axle turnings	8 00
Wrought turnings (free from cast)	6 50
Cast borings	5 50
Uncut wrought iron boilers	4 00
Steel boiler plates	8 00
Grate bars	5 50
Pipes and flues (clean)	7 00
Tank iron	6 75
Hoop and band iron	6 00
Sheet iron	5 00
Wrought drillings	6 50
Malleable iron	7 00

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. mill)	1.25c@1.35c
Angles	1.20c@1.25c
Tees	1.35c@1.45c
Universal Plates	1.20c
Sheared Plates	1.30c

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 30
4½ to 6 by ⅜ to 1 inch	1 35
1½ to 6 by 1⅛ to 2 inch	1 50
1¼ & 1⅜ by ⅜ to ¾ inch	1 35
1 & 1⅛ by ⅜ to ¾ inch	1 40
⅝, ¾, ⅞, by ⅜ to ⅝ inch	1 50

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.

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283 W. River St., CLEVELAND, O.

AUTOMATIC MACHINERY.
Power Presses, Dies, Drop Hammers, Punches and Shears, Wire Straighteners and Cutters, Wire Forming Machines
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OF ALL KINDS FOR
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LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.

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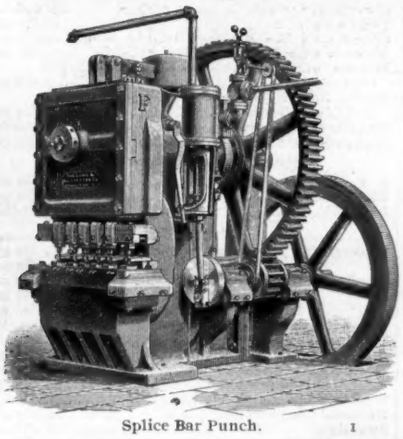
OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.



Splice Bar Punch. 1

—THE—

Long & Allstatter Co.

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Manufacturers of Belt, Steam and Electrically driven

POWER PUNCHES and SHEARS,

for all kinds of Boiler, Tank and Structural Iron Work, Rolling Mills, Locomotive Shops, Car and Wagon Shops, Plow Shops, etc. Send for Catalogue.

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Works and Mines, Westmoreland, Pa

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FOR TIN OR SHINGLE ROOFS AND IRON WORK. IT IS ABSOLUTELY WITHOUT AN EQUAL.

Tin roofs well painted have not required repainting for 10 to 15 years.

If you need any paint it will pay you to send for circular.

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CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE
Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

Round and Square.

1 to 1⅞ inch	1 30
2 to 2⅝ inch	1 40
2¾ to 3¼ inch	1 55
3⅜ to 4 inch	1 80
4⅛ to 4½ inch	2 40
4¾ to 5 inch	2 60

Oval.

⅜ to 1¼ inch	1 50
⅜ to ¾ inch	1 50
½	1 70
⅝	1 90

Half Oval and Half Round.

1½ to 3 inch	1 85
⅜ to 1½ inch	1 65
⅜ to ¾ inch	1 90
½	2 05
⅝	3 15

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 40
1 to 1⅜ by ¼ and 5-16 inch	1 45
¾ to ⅞ by ¼ and 5-16 inch	1 55
½ to ⅝ by ¼ and 5-16 inch	1 80

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 85
1 7-16 to 2, No. 17, 18 and 19	1 90
1 7-16 to 2, No. 20	2 00
1 7-16 to 2, No. 21	2 10
1 7-16 to 2, No. 22	2 20
1⅛ to 1⅜, No. 13, 14 and 15	1 90
1⅛ to 1⅜, No. 16, 17 and 18	1 95
1⅛ to 1⅜, No 19 and 20	2 00
1⅛ to 1⅜, No. 21	2 10
1⅛ to 1⅜, No. 22	2 20
15-16 and 1 inch, No. 13, 14 and 15	1 85
15-16 and 1 inch, No. 16, 17 and 18	2 00
15-16 and 1 inch, No. 19 and 20	2 10
15-16 and 1 inch, No. 21	2 20
15-16 and 1 inch, No. 22	2 30
⅞, No. 13, 14 and 15	2 10
⅞, No. 16, 17 and 18	2 20
⅞, No. 19 and 20	2 30
⅞, No. 21	2 40
⅞, No. 22	2 50
13-16, No. 13, 14 and 15	2 20
13-16, No. 16, 17 and 18	2 30
13-16, No. 19 and 20	2 40
13-16, No. 21	2 50
13-16, No. 22	2 60
¾, No. 13, 14 and 15	2 30
¾, No. 16, 17 and 18	2 45
¾, No. 19 and 20	2 55
¾, No. 21	2 65
¾, No. 22	2 75
11-16, No. 13, 14 and 15	2 55
11-16, No. 16, 17 and 18	2 60
11-16, No. 19 and 20	2 70
11-16, No. 21	2 80
11-16, No. 22	2 90
11-16, No. 23	3 00
⅝, No. 13, 14 and 15	2 60
⅝, No. 16, 17 and 18	2 70
⅝, No. 19 and 20	2 80
⅝, No. 21	2 90
⅝, No. 22	3 00
⅝, No. 23	3 10
9-16, No. 13, 14 and 15	2 80
9-16, No. 16, 17 and 18	2 90
9-16, No. and 20	3 00
9-16, No. 21	3 10
9-16, No. 22	3 20
9-16, No. 23	3 30
7-16 and ½ inch, No. 13, 14 and 15	3 00
7-16 and ½ inch, No. 16, 17 and 18	3 10
7-16 and ½ inch, No. 19 and 20	3 20
7-16 and ½ inch, No. 21	3 30
7-16 and ½ inch, No. 22	3 40
7-16 and ½ inch, No. 23	3 50
⅝, No. 13, 14 and 15	3 50
⅝, No. 16, 17 and 18	3 60
⅝, No. 19 and 20	3 70
⅝, No. 21	4 00
⅝, No. 22	4 10
⅝, No. 23	4 25

Light Band.

1½ to 6 by ⅛ to 3-16 inch	1 60
1½ to 6 by Nos. 11 and 12	1 65
1 to 1¾ by ⅛ to 3-16 inch	1 65
1 to 1¾ by Nos. 11 and 12	1 70
⅞ and 13-16 by ⅛ to 3-16 inch	1 80
⅞ and 13-16 by Nos. 11 and 12	1 85
¾ and 11-16 by ⅛ to 3-16 inch	1 90
¾ and 11-16 by Nos. 11 and 12	1 95
⅝ and 9-16 by ⅛ to 3-16 inch	2 05
⅝ and 9-16 by Nos. 11 and 12	2 10
½ by ⅛ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	1 80
⅞ inch, " " " " 13 and 14	1 90
¾ inch, " " " " 11 and 12	1 95
¾ inch, " " " " 13 and 14	2 15

Sheet Iron.

No. 10	1 85
No. 12	1 90
No. 14	1 95
No. 15-17	2 05
No. 18	2 20
No. 20	2 30
No. 22-24	2 40
No. 25.26	2 50
No. 27	2 60

Steel Boiler Plates—1-4 in. and Heavier.

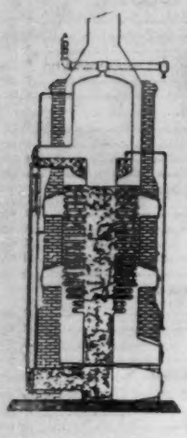
Tank	1 60
Shell	1 85
Flange	2 10
Marine Flange	2 35
Fire Box	3 35

Above includes plates 90 inches wide.

90 to 96 in. wide	⅛c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1¼c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs
1 to 2 in. inclusive	08
9-16 to ⅞ in. "	08½



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WATER TUBE BOILER.

This Boiler is absolutely safe from explosion. Gives as much steam from the waste heat as any boiler made. Easy of access for cleaning and repairs. Furnishes perfectly dry steam. Occupies little ground space. Economical in first cost. Send for complete circulars giving list of users and testimonials, one of which is printed below.

The Falcon Tin Plate & Sheet Co.,
NILES, O., Aug. 18, 1893.

Chas. P. Adams, Esq.

Dear Sir: The three boilers of 225 H. P. each which you furnished us are working in every way satisfactory. We consider them as good steamers as any we have ever used. Up to the present time have spent nothing on them for repairs. Very respectfully,

THE FALCON TIN PLATE & SHEET CO.,
By Warner Arms, Pres't.

C. P. ADAMS.
807 The Cuyahoga, - CLEVELAND. O.

C. W. HUNT COMPANY,
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INDUSTRIAL RAILWAYS.

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Blooms, Billets, and Slabs, Steel Rails, Steel Beams, Channels and Angles. Steel Forgings, Bar Spring, and Sleigh Shoe Steel. Steel Wire of all kinds. Barbed Wire, Iron and Steel Plates, Galvanized and Black Sheet Iron and Steel Corrugated Iron Roofing.

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MFG. CO.,
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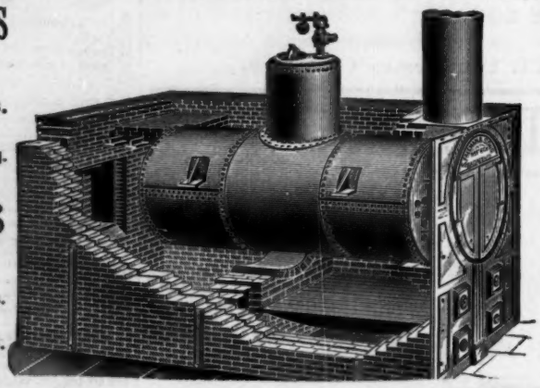
MANUFACTURERS OF
Standard Tubular, Fire Box, Vertical and Submerged Tube Steel
BOILERS
For Stationary, Portable, or Marine use.
Also of TANKS of all kinds.
Smokestacks, etc.,
Grey Iron Castings.
Write for Prices and Terms.



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FLEHARTY, J. H. & Co., Rubber Stampes Seals, Stencils, Automatic Check Punchs, and Numbering Machines. 92 Seneca St.

7-16 to ⅜ and 2⅜ to 3 in.	.09
3⅛ to 4 in.	.09½
⅝ to 11-16 and 4⅛	.10
⅛ to 6 in.	.10½
¼ to 9-32 and 6⅛ to 7 in.	.11
3-16 in	.13

Flats.

	cts. lbs.
2 to 9-16 in. wide by 2 to ⅝ thick	.8

Bessemer and O. H. Steel.

Machinery	base price,	1 80
Tire	"	1 85
Spring	"	2 20
Sleigh Shoe	"	2 20
Toe Calk	"	2 05
Cutter Shoes, tapered and bent	"	2 45

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 70
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 40

MACHINERY SUPPLY MARKET.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis 45

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 35
Horton's Universal	dis40
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

Emery.

	No. 4 to No. 54 to Flour, C. F		
	46 gr.	150 gr.	F. FF.
Kegs ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

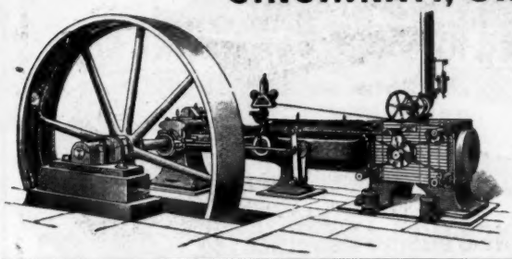
Detroit	dis 60@70
Norton's	dis 60@70
Grant	dis 60@70
Sterling	dis 60@70
Celluloid	dis 10&33⅓
Northampton	dis 55
Crystal	dis 65@70
Vitrified	dis 60@70
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



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Shafting, Hangers, Pulleys.

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HARTFORD, CONN.

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C. A. BURWELL, Chief Inspector, 208 Superior St., Cleveland O.

J. E. WOLCOTT, Special Agent, 96 4th Avenue, Pittsburgh, Pa.

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME. * Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	†12:45 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	† 3:25 pm	† 9:50 am
Hudson and Ravenna	* 5:00 pm	* 8:25 am
Philadelphia and New York	*11:10 pm	* 5:25 am
Baltimore and Washington	*11:10 pm	* 5:25 am
Alliance and Pittsburgh	*11:10 pm	* 5:25 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:40 am	* 5:15 pm
Akron and Columbus	* 8:40 am	*5:15 pm
Akron, Columbus & Zanesville	†2:45 pm	*12:10 pm
Akron and Orrville	† 3:25 pm	† 9.50 am
Columbus and Cincinnati	* 8:00 pm	* 6:55 am

Saturdays the 8:00 pm train will leave at 11:20 pm.

Valley Ry.

Depot foot of So. Water St.
City Office 137 Superior St.

	Arrive.	Depart.
Akron & Canton	*6:30 P M	*7:10 A M
Akron, Canton & Valley Jctn.	*10:10 A M	*3:15 P M
Valley Jctn. & Way Stations	†6:30 P M	†7:10 A M
Akron, Canton & Chicago	*8:00 A M	*6:30 P M
Wooster and Chicago	†2:45 P M	†11:00 A M
Wooster		*6:30 P M
Akron, Canton & Marietta	†2:45 P M	†11:00 A M
Steubenville, Wheeling, Washington, D. C., and Baltimore	†2:45 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule Drawing Room cars between Cleveland and Chicago.

WANTED!

Second-Hand Iron Tank, about 6 ft. by 6 ft.

Address, stating price,

The Cleveland Ptg. & Pub. Co.,

27-31 Vincent St., CLEVELAND, O.

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AND

METALLURGISTS

WILL FIND THE

"Chemical and Metallurgical

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recently issued by J. H. CREMER and G. A. BICKNELL, of Cleveland, a valuable compendium of formulas and information called for in their work every day.

Leather, $2.50. Cloth, $2.25.

SOLD BY

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Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....12c
" " " " over 5 lbs.....10c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3½	3½
Hexagon	15½	11¼	8½	6	5¾	5¼	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887.....dis 85
Standard Penny Nails, ₩ keg card rate
Car lots.....$1.10
Less than car lots.....$1.25

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 9@10
Russia " " .....₩ lb 14
Italian " " .....₩ lb 13@19
Plumbago Piston.....₩ lb 40
Peerless.....₩ lb 60
Morrison's " .....₩ lb 45
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48
Rainbow.....Full Rolls.....45c ₩ lb; Less than Full Rolls. 50c ₩ lb
Eclipse Gasket.....₩ lb 75

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 50
Medart Pulleys.....dis 50
Split Wood Pulleys.....dis 55@60

Rivets.

Iron, Thousand, list November 17, 1887 dis 50&10@60
Iron, Ordinary, Cooper's Block and Carriage list November 17, 1887.....dis 50&10@60
Copper.....dis 50@50&10

Saws.

Disston's Circular.....dis 40&10
" Band.....dis 25
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Diston's.....dis 30
Atkins' Circular Saws.....dis 40&45
" Mill, Mulay and Drag Saws.....dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....70c per ft
" Dexter Cross-cuts.....50c "
" Diamond " .....30c "
" Tuttle Tooth Cross-cuts.....25c "
" One-man Cross-cuts.....32c "
No. 1 Handles.....23c per pair
No. 6 " .....16c "
Excelsior Saw Tools.....$6 per doz
Derfection " .....$15 "
Petroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2¼ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Apr. 9, 1894

Brass.....dis 40
Copper.....dis 40
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75& 5
" " Nos. 27@36.....dis 75&10& 5
Coppered Nos. 0 to 18, market list.....dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis65& 5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95c ₩ lb dis 30

Wrenches.

Coe's genuine.....dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanic's.....dis 55&10& 5
Bemis & Call's Combination.....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 25
William's " " .....dis 25
Alligator " " .....dis 40

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The name of the Chicago, Milwaukee & St. Paul Railway has long been indentified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company's lines.

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A number of new factories have been induced to locate—largely through the instrumentality of this company—at towns on its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is Westward. Nothing should be permitted to delay enterprising manufacturers from investigating. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

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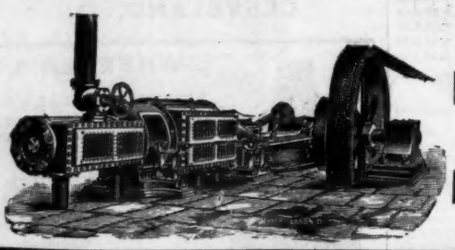

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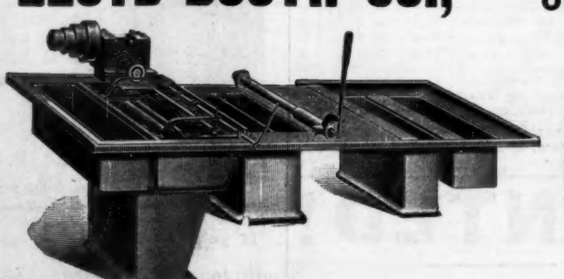

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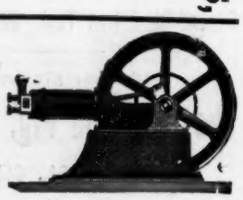

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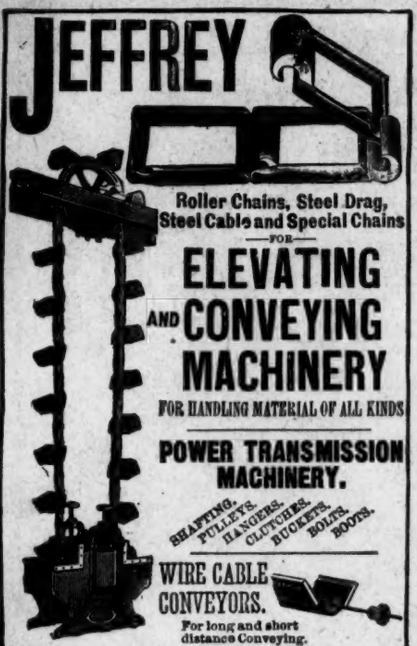

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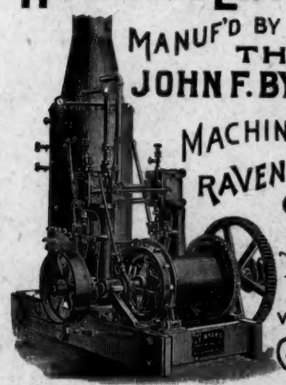

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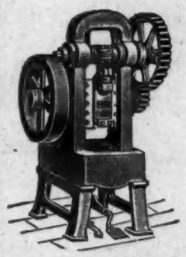

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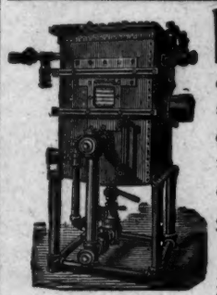

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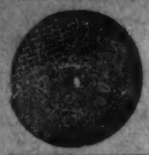

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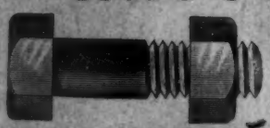

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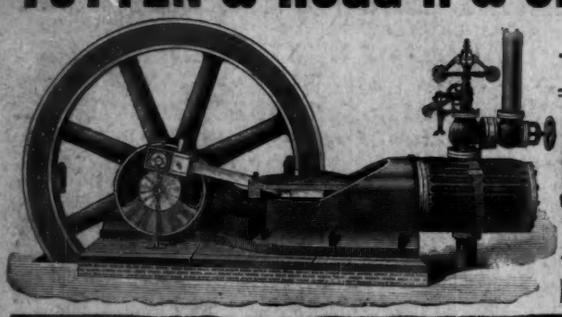

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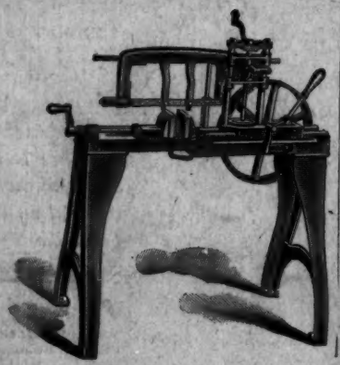

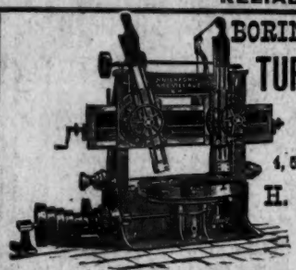

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